Organic Gardening

APRIL 1948
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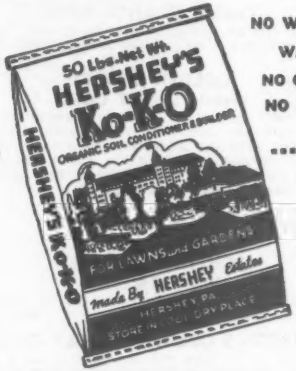

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HERSHEY ESTATES

HERSHEY, PENNSYLVANIA

ORGANICALLY GROWN FOODS AND HEALTH

October 20, 1947.

Dear Sir:

As we are very interested in nutrition and how to grow vegetables and fruit containing the minerals and vitamins that we know mean undreamed of good health, we will be very happy to learn how to make compost and improve the soil.

A few years ago, we planted a vegetable garden on ground that had not been planted for many years. The weeds had just grown on it and gave back into the soil what they had taken out of it.

Our garden was really wonderful and many people stopped to comment on it. Everything grew and looked so good. We had all the vegetables we could use and some for our neighbors.

At that time we were learning about food values, vitamins and minerals in food and how to retain them through proper handling and cooking methods, and had changed our diet to contain all the foods for good health. We were 45 and 52 years of age with our health breaking down—really feeling old. It was no time at all until we noticed that we were walking with less effort, sleeping and resting like we had never done before. In a year, we gained health we had never believed possible. As far back as we could remember we had never felt so well. All our ailments disappeared, our resistance to colds and infection increased so we could throw off a cold in a few days, leaving no weakened condition. For me that was a miracle; even as a child I had suffered from severe colds with weeks in bed every winter.

Since then we bought a place of ten acres of plums and apricots, a few

(Please turn to page six)

Nature's Planting Schedule

By Dr. William H. Eyster

For best results with vegetables and annual flowers it is important to start the plants at such time that they will be in tune with the advancing seasons. The best way to accomplish this is to use the blooming time of various perennials as indicators of the time to plant vegetables and annual flowers. In Nature's planting schedule given below, various perennials are used to announce the time to plant the different vegetables and annual flowers which are grouped according to their ability to resist low temperatures. On this basis they are classed as ultra-hardy, hardy and so on to the extra-tender plants which are least able to withstand low temperatures.

I. Ultra-hardy vegetables should be planted when skunk cabbage blooms.

Asparagus	Horseradish	Parsnip
Rhubarb	Salsify	Winter onion

II. Hardy vegetables and annuals should be planted when glory of the snow, trailing arbutus, forsythia, and Siberian squills are in full bloom.

Beets	Cress	Onion	Spinach	Calliopsis
Cabbage	Endive	Parsley	Radish	Candytuft
Chard	Kohlrabi	Parsnip	Turnip	Mignonette
Chervil	Leeks	Peas	Amaranthus	Snapdragon

III. Semi-hardy vegetables and annual flowers should be planted when shadbush, flowering quince, bleeding heart, narcissus are in full bloom.

Broad bean	Annual 'mums	Gaillardia	Pansy
Broccoli	Annual phlox	Helichrysum	Petunia
Cauliflower	Baby's breath	Lobelia	Pinks
Celeriac	Calendula	Lupine	Scabiosa
Celery	Clarkia	Marigold	Stock
Corn Salad	Cleome	Nemesia	Zinnia
Potatoes	Four o'clock	Nicotiana	

IV. Semi-tender vegetables and annual flowers should be planted when redbud, dogwood, Darwin tulips, and lilacs are in full bloom.

Corn	Squash	Celosia	Nasturtium
Cucumbers	Zucchini	China Aster	Salpiglossis
Muskmelons	Arctotis	Cynoglossum	Statice
Pumpkin	Argemone	French marigold	Sunflower
Snap beans	Balsam	Morning glory	Sweet Sultan

V. Tender vegetables and annual flowers should be planted when pinxterbloom, honeysuckles, spiraea are in full bloom.

Bush lima beans	Ageratum	Scarlet runner bean	
New Zealand spinach	Browallia	Torenia	
Soybeans	Castor Bean	Verbena	Hyacinth bean

VI. Extra tender vegetables and annual flowers should be planted when flame azalea, beauty bush, peony, black locust are in full bloom.

Egg plant (plants)	Sweet potato (plants)	Dahlia (plants)
Okra	Tomato (plants)	Portulaca
Pepper (plants)	Watermelon	Salvia
Pole lima beans		

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So if you are concerned with the continuous productivity of your soil over the years, as well as immediate results — use DRICONURE. You will find it economical because it is *all* plant food; there is no waste or no useless filler just to add bulk. Combining practically all essential fertilizing elements, it is dehydrated and finely pulverized for convenience in handling; practically odorless; completely free of weed seeds, fungus disease spores or insect eggs. At the same time its use encourages essential bacterial activity.

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Literature on Request.

peaches, three bearing orange trees, a place for a cow, chickens, and a vegetable garden— everything conducive for maximum health; but with all that we noticed we didn't have the pep and vitality we had before we moved here and have felt that there was something lacking in the soil. We have tried different methods of improving it, but could not reap the same "breath-taking" results as from our garden on the virgin soil which teemed with earthworms.

We are hoping now your books on compost and organic gardening are going to solve our problems. We are convinced and hope to prove to ourselves that refined foods and depleted soil are seriously undermining the health of the American people today.

We would not take a fortune for what we have learned of food values. Good health is something money cannot buy.

Mrs. Roscoe Murray,
R. 2, Box 690,
San Jose, Calif.

—o—

WORTH A "TRY"

February 6, 1948.

Gentlemen:

My problem in gardening is to first conserve moisture and to subdue weeds (foxtail grass) so here is how I will endeavor to build the garden this season. Using newspapers, 12 ply 22" wide pinned down with laths which will be drilled so that I can pin them in place with butcher wood skewers— under the newspapers I will lay an inch of dead leaves.

The rows of vegetable seed will be planted in two inch spaces. Thus I will do all the work in April and not have to cultivate in brutally hot weather of July and August. It won't look "purty" but maybe I can spread lawn clippings on top of the papers.

Fred C. Rodman,
82 Beaver Street,
New York 5, New York.

EDITOR'S NOTE:—Good garden soil is inhabited by billions of microscopical-

ly small soil organisms called bacteria, actinomycetes, fungi, and many soil animals including the earthworms. Of these soil organisms, some decompose starches and sugars, some break down cellulose, some decompose fats, and others decompose lignin. These different organisms work like gangs of workmen who take down and reclaim an abandoned house and prepare the different materials of which it is composed to be used again in a new structure. Some of these organisms of decay in the soil do their best work when they are in the upper inch of the soil, others function better when they are four or six inches below the surface of the soil. In other words, each kind of soil organism has a place in the soil where it can do its best work. Digging the soil throws these organisms out of place and interferes with their normal activities. This is the reason that soils which are never dug up but are properly mulched are often more productive than soils that are frequently cultivated. By mulching your soil you are not only saving yourself work in the hot summer months, but also permitting the various soil organisms to occupy the position in the soil best suited for their beneficial activities.

—o—

PLANT MATERIALS ARE AVAILABLE

February 11, 1948.

Gentlemen:

Last spring I felt like thousands of other prospective organic gardeners as to the futility of securing sufficient raw material for building an early spring compost pile but this past winter that problem was solved and I thought other organic gardeners would like to know how it was done.

One afternoon while trying to find a place to park my car so I could shop, I passed the rear of an A&P supermarket and noticed a city garbage department truck loading cases of green stuff on the truck to be hauled to the city incinerator. The next

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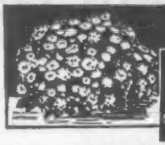

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day I contacted the manager of the store and explained my reasons for securing some of this material and he in turn informed the manager of the vegetable department to save all trimmings and spoiled fruit and vegetables and that I would pick it up daily.

This took place between Christmas and New Year's Day and for the past 3 weeks I had to quit picking it up because of no place to put any more. The daily pickup averaged 4 cases (standard head lettuce shipping cases) and from 10 to 23 cases on Saturdays. This all from only one supermarket and there are hundreds of these all over the country that I feel sure would cooperate in the same manner with other gardeners.

This refuse contained the following material: head lettuce trimmings, cabbage and broccoli trimmings, celery trimmings, wilted brussels sprouts, lettuce, cauliflower, endive, cucumbers, collards, green onions, dry onions, mushrooms, white potatoes, sweet potatoes, squash, apples, pears, peaches, grapes, tomatoes, grapefruit, tangerines, oranges, pineapples, lemons and others.

On one day alone there were 2 bushels of acorn squash and 1 bushel of sweet potatoes. The green material is only part of the value as the lettuce cases are usually made of a good grade of white pine and have 2 widths of side and bottom slats which with ends of orange crates cut down and nailed together make perfect standard size seed flats. The horticulturist at the Washington Park Greenhouse asked me where I bought my flats as he would like to purchase some of the material.

In the short time I have been collecting this material I now have enough material on hand to assemble 1000 3¼ depth flats and 500 2¼ inches.

As to manure, it is impossible to purchase; the reason being that all leased truck farms in the Chicago district contain a clause that requires all manure to be returned to the soil.

However, I spent some time scouting around the surrounding country and found a riding stable some 15 miles from here and the operator who has 35 horses said I could have all the manure I wanted at no cost whatever. I now have 3 loads of horse manure and am waiting for spring to come so I can get my material in the compost pile and make room for more material.

I intend to purchase from 3 to 6 acres as soon as some of the land owners in this territory come down out of the clouds and sell land (which has been mistreated with chemicals for years) for less than pure gold (3 to 5 thousand per acre). I know that enough material from 2 supermarkets can be obtained to produce 10 to 20 tons of compost a year when combined with other farm materials.

As for the truck gardeners who say, "Well, organic gardening may be all right but where can anyone get the material?" I say get off your easy chair in the winter and scout around as I did and you will find more than you can use. The little extra labor involved will pay you handsomely in fertilizer savings, better crops and, later, in a live fertile soil.

James L. Stull,
4134 Wegg Avenue,
East Chicago, Indiana.

—o—

GOOD LIVING

February 10, 1948.

Dear Sirs:

We would like to take this opportunity to tell you about the wonderful results we have obtained. We started with a brand new house two years ago last Christmas. It was built on land formerly farmed by Future Farmers. The land had been sprayed and chemically fertilized until there wasn't an earthworm left—but there was an abundance of aphids and other pests.

We started to compost immediately using table refuse and clippings and leaves which we begged from our neighbors. We rock mulched our new trees and as a result of our efforts, we had all we could eat and can of straw-

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berries, boysenberries, figs, plums, tomatoes, besides giving generously to many of our friends. We also had enough peaches and apricots for table use. Next year we will have an abundant supply of grapes to add to the list. Now our ground is literally alive with earthworms and we did not knowingly plant a single earthworm.

Incidentally, we sold $20.00 worth of strawberries in addition to those we used for ourselves and gave to our friends. At the height of the season our seven short rows yielded from 10 to 15 baskets per day. Our next door neighbor had a larger patch, and with all his chemical fertilizer did not grow enough berries to supply his family.

You can understand why we practically force our friends to borrow our *Organic Gardening Magazines*. With your publications to read and our yard and garden as evidences, they can't help being convinced that the organic way is the only way.

Mr. and Mrs. Ralph Ryan,
515 Loch Lomond Drive,
Bakers Field, California.

—o—

VEGETABLE STORAGE

January 24, 1948.

Dear Sir:

I know you and the readers of *Organic Gardening* will be glad to know of an excellent method of storing carrots over winter, which we have found good after learning about it from some friends.

Wait until advent of cold weather and frosts (November). Dig carrots. To prepare them for storage in a cold fruit cellar, simply cut off the green top a little below the yellow meat part of carrot, in order to keep the tops from sprouting when in storage, thus taking away strength. Then wash them, dry them off with a dry cloth, but leave them damp. Place into an earthen crock, and cover with a paper cover, which does not need to be air tight. Set in fruit cellar where they will be cold. You will have as nice carrots at Easter as you had when

they were dug up. No leaves, or sand, or burying is necessary, or digging around in the ice.

I enjoy reading your magazine, but must admit that a minister in the city can't do much along the line of organic composting. To compensate, I try to induce some of my friends to do the experimenting.

Rev. C. A. Bormann,
617 Pine St.,
Mt. Pleasant, Mich.

—o—

GAS FOR COOKING

February 15, 1948.

Dear Sir:

Living outside the city limits I have a septic tank. It is 4 feet square and 5 feet deep. On the inlet I have an elbow below the water line as well as on the outlet, and I get enough gas

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D—11" SWINGING LABEL white Zinc Name Tab secured to single **ALUMINUM** Standard, adjustable to flat position for easy reading when standing over it. Can be pushed down flat for winter, nice for tulips and other bulbs. Will be bright and legible when springtime comes.
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E—11½" OK ROSE MARKER. A new 1948 introduction Large **WHITE ZINC** name plate has wide flanges with four accurately spaced holes thru which stiff **ALUMINUM** standards freely slide up over the tilt into secure position. A new plate can be put on easily. The price is a little higher for this better marker but worth it.
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MICHIGAN BULB CO., Dept. ow-1811 Grand Rapids 2, Mich.

for my wife to do the cooking. It has occurred to me that by making my pit deeper and longer and covering it with a tight lid I might get enough gas to also heat my house. I have read somewhere, sometime, that farmers could make a pit and fill it with corn-stalks and get enough gas for both heat and light. In these days of fuel shortages, something like this would help a lot of people.

Wm. E. McKibben,
1320 Carrie Avenue,
Des Moines 15, Iowa.

(Editor's note: The carbon dioxide given off by organisms which carry on aerobic respiration is incombustible and will not burn. Hydrocarbons and other combustible gases produced by anaerobic organisms can be used for fuel. Because of the danger of forming explosive mixtures of gas and air, the collection and storage of the gas requires great precautions.)

—o—

ADVANTAGE OF A FIXED COMPOST PIT

February 14, 1948.

Dear Sir:

My small garden is about 95% roses, and in this climate roses must be protected or replaced each year. I use the leaves from our shade trees, mostly maple, and each fall I use four to five loads to cover about 100 rose bushes. In the spring, when this winter protection is removed it is piled up in a bin and allowed to rot down to leafmold. When I first started this practice, it required 3 to 4 years for the leaves to come to a usable state. Piling them in the same spot year after year has so loaded the soil with the needed bacteria that now the leaves I pile up in the spring can be sifted through a ⅜ inch mesh screen in October of the same year. There are some leaves in the center of the pile that are only half rotted as the pile is not turned over, but all those at the edges where the air can act on them

are down to a fine mold in six months. The incompletely decomposed leaves serve as an excellent activator for new heaps. The leaf pile is in the shade, and outside of an occasional hosing, they get no attention.

K. Coward,
386 Albert Street,
Kingston, Ontario, Canada.

—o—

COMPOSTER'S REPORT

October 15, 1947.

Gentlemen:

Answering your request for reports on results secured from the use of the Bruce formula activator I submit the following:

When my garden peas, some of them of the salad type and of heavy growth, were through I started a compost pile using the pea vines without cutting, just as they were pulled from the ground: a layer of vines, then a layer of black earth, a very thin layer of poultry manure, a sprinkling of ground oyster shell, then repeat. Topping this with a layer of black earth, I let it stand until my string bean plants were ready to pull when I com-

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pleted the pile, substituting beans for peas. When all was completed, about 6' x 6' x 5' high—I let the heap stand a few days and inserted the Bruce preparation according to instructions.

When my sweet corn was done I started another pile after the same pattern except that I cut the corn into about ten inch lengths; Bruce formula was inserted as before.

I noted no signs of heating, but when I tore the heaps open I found the disintegration complete and the product a most perfect, friable substance easy to handle and entirely unobjectionable. A cross section of the pile shows the layers as piled but the mixing becomes perfect on cutting down through it and throwing it into another pile. It is fair to remark that the quantity of poultry manure was very small.

H. M. Wagner,
Route 2, Box 227,
De Funiak Springs, Florida.

—o—

AMARYLLIS THRIVES IN COMPOST

February 11, 1948.

Dear Sir:

I have, through experience, seen the destruction of earthworms and the disappearance of the soil's fine texture until it became much like the substance of the chemical fertilizer itself.

My soil became so poor through the use of chemical fertilizers that I wouldn't use any of it to repot my amaryllis bulbs that I prize highly. In the fall I secured a bushel basket and some virgin soil and placed a layer of earth in the bottom of the basket, then some crushed leaves, sheep manure, and some bone meal, then the layering repeated until the basket was full. I left this stand out all winter in the rain and snow, and in the spring I repotted my plants, and then buried them under some shrubs up to one inch of the tops of the pots. In the fall I brought them in and put them in a cool room (60-65 degrees F.). You should have seen these plants flower

around Easter, and each bulb developed two large bulbs, one on each side of the original bulb. Toward spring I foolishly thought my plants would benefit by an application of commercial fertilizer. My plants did so well that I believed that all the fertility had been taken out of the soil. Shortly thereafter, several large worms that I didn't know existed in these pots came to the surface and died.

My experiences with earthworms and chemical fertilizers do not agree with the reports given out recently by Dr. Firman E. Bear of the New Jersey Agricultural Experiment Station. I would like every farmer, gardener, plant lover, and Dr. Bear to make a flower pot experiment of both methods (chemicals and compost) and form their own opinions.

Mrs. R. Westlake,
75 East Madison Avenue,
Dumont, N. J.

—o—

BEES IN CANAAN

February 17, 1948.

Dear Editor:

Bees were both native and abundant in Canaan. The first mention of bees is in Deuteronomy 1:44 when the Israelites were enroute from Egypt to Canaan.

A. I. MacKay,
Samarand, Maple Bay P. O.,
Duncan, V. I., B. C.

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Dept. O., LaVerne, Calif.

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At BROOKINGS, OREGON

The Healthy Hunzas

Chapter IX from the forthcoming book called "The Healthy Hunzas" to be published by Organic Gardening Magazine

THE Hunzukuts (Hunzas), in their agriculture, are remarkably fortunate in having a valuable additional soil amendment—something that supplements in a most valuable manner the animal manures and composts which we have already discussed. Sir Albert Howard in his *Agricultural Testament* has described it in a manner worthy of repeating. He says:

"There is one point about the Hunza agriculture which needs further investigation. The "staircase" cultivation of these hillmen received annual dressings of fresh rockpowder, produced by the grinding effect of the glacier ice on the rocks and carried to the fields in the irrigation water. Is there any benefit conferred on the soil and on the plant by these annual additions of finely divided materials? We do not know the composition of this silt. If it contains finely divided limestone its value is obvious. If it is made up for the most part of crushed silicates, its possible significance awaits investigation. Do the mineral residues in the soil need renewal as humus does? If so, then Nature has provided us with an Experiment Station ready-made and with results that cannot be neglected. Perhaps in the years to come, some heaven-sent investigator of the Charles Darwin type will go thoroughly into this Hunza question on the spot, and will set out clearly all the factors on which their agriculture and their marvelous health depend."

Similarly, the Nile River carries along eroded, silt-like masses of ground up rocks which it deposits on the desert soils of Egypt and which at times has brought forth the richest crop on earth. For thousands of years the Egyptian fellah has farmed with the benefit of these silt-laden waters exclusively, using little or no manures. Emil Ludwig in his book *The Nile,* wrote:

"Yet here, as everywhere else, nature proves a cool and accurate calculator. Having brought fertilizing substance from Abyssinia to the soil of the rainless oasis, then, the heat cracked and split the clay soil so that the sun and the silt can penetrate it thoroughly, it spreads the next flood over fields which, even without the plough, are ready to bear fresh crops, and better crops, for in the depths the silt has loosened substances which promote their growth. Even the course of history was pressed into service, for the ruins of old towns and villages built of Nile mud were a rich source of manure."

But today, says Ludwig, the uneconomic methods of agriculture have to be counteracted by manure; for the first time in thousands of years, the fellah has to manure the soil of Egypt. In addition to this, due to a certain type of snail which is spreading a parasitic disease, a potent poison, copper sulphate, is being put in large quantities into the Nile and its network of canals. Will its ultimate effect on the health of the Egyptians be worse than the parasitic disease? This

parasite has been found in preserved human viscera 3,000 years old.

To understand the value of ground up rocks as a source of soil nourishment one must study some elementary geology. Originally soils, directly or indirectly, were formed from rocks. I have seen a pile of fine rock residues at a quarry that over a period of thirty years had turned into an earth-like mass. Today our soils consist of about 95% rock constituents and only 5% or less of organic matter. Not only has soil formed this rock, but through the processes of erosion, over a period of millions of years the soil will turn again into rock, by being deposited into the beds of lakes and oceans where rock formation takes place.

Originally the entire earth was one mass of rock and the only living things were microbes. These bacteria and fungi through their activities liberated carbon dioxide and certain organic and inorganic acids which have a solvent action upon rocks, beginning the process of their break-down into soil. The dead bodies of these organisms were the beginnings of the organic matter which was mixed with the fragments of rocks to form soil. The action of heat and cold, water, other atmospheric influences and biological factors soon took a hand in the procedure. The difference in temperature between day and night caused expansion and contraction which produced open seams and detachment of fragments, which were more readily vulnerable to the agencies already mentioned.

The first growths to appear were lichens and mosses which slowly formed a film of soil over rocks. You can see it today. It is amazing but true that lichens can take hold and survive on bare rocks. They are a peculiar type of plant consisting of two partners—an alga and a fungus. Arctic explorers who have been saved from starvation by eating lichen have called them "rock tripe." They provide the foothold for plants which are the next step up the scale—the ferns, and gradually we have forests and trees and soil many feet thick. You can get a graphic picture of soil formation by observing roads which have been cut into hills. You can see the soil overlaying the rocks.

Recently J. David Larson, of Hinsdale, Illinois, worked out a process of making synthetic soil. He uses ingredients consisting of clay, limestone, ground rock, peat, manure and other substances which he mixes and permits to ferment. I do not know the percentage of rock powder and ground limestone he uses, but it must be substantial in order to duplicate the natural make-up of soil.

In our review of elementary geology, we must also discuss the make-up of rocks. What elements do they contain that are helpful to growing plants? In fact, what are rocks? If we can learn what they consist of, and if we can likewise ascertain what chemical fertilizers are made up of, we will not only be learning a great deal for one lesson, but we can better judge the value of each as a fertilizer.

Let us take phosphate rock of which there are large deposits in Tennessee and Florida. One specimen contained the following ingredients:

Calcium phosphate	65.88000
Calcium carbonate	4.88000
Calcium fluoride	5.91000
Iron oxide	4.50000
Iron sulphide	.94000
Alumina	6.64000
Silica	7.01000
Manganese dioxide	1.50000
Sodium	1.31000
Potassium	.37000
Copper	.01000
Chromium	.10800
Magnesium	.68000
Strontium	.01000
Borium	.01760
Lead	.00200
Zinc	.01900
Vanadium	.00100
Titanium Oxide	.02900
Boron	.00120
Nickel	.00100
Silver	.00020
Iodine	.00103
Undetermined	.17997
	100.00000%

The main requirements of a fertilizer are nitrogen, phosphorous and potash. Nitrogen is rarely found in rocks. It is furnished by manure, plants and from the air. There are other much needed elements, however, such as iron, calcium, magnesium, carbon, copper, aluminum, sulphur, zinc, boron, fluorine, cobalt and manganese, which must be present for plants to be healthy. You will find many of these minerals present in the phosphate rock break-down already given. Note that the potassium content is extremely low. There are other rocks, especially of the granite type which are much higher in this mineral. Let us look at an analysis of a rock called *diabases*:

Silica Oxide	54.52
Aluminum Oxide	19.10
Iron Oxide	8.72
Calcium Oxide	7.25
Magnesium Oxide	3.92
Potassium Oxide	2.30

Note the higher potassium content. There are rocks with a potassium content as high as fifteen percent or more. Such a rock would be dangerous for use as a fertilizer because the potash is too concentrated. A remarkably valuable soil amendment could be had if the wide variety of rocks such as limestone, granites, trap-rocks, sandstones, shales, etc. were studied and applied to the land scientifically in a ground-up, flour-like form.

Now, these ingredients that you find in rocks are the same as those in chemical fertilizers except that in the latter they are in soluble or quick-acting form and in larger quantities. But, if the rock is ground fine enough, and today there is machinery that can do it, it acts far more quickly than the coarsely-ground rock powders of years ago. Modern agricultural science has not done much experimental work with fine rock powders, which are mild substances that can benefit the soil without harming its biological life. Your chemical fertilizers originate directly or indirectly from rocks or mineral deposits but the trouble is that they are too highly concentrated. As already mentioned, deposits of potash are used in which the potassium content is much too high. Potash in the opinion of some investigators, is a dangerous element if used to excess. Another drawback is that chemicals such as sulphuric acid are mixed with ground phosphate rock, and the resultant chemical fertilizer, superphosphate, is quick-acting but harmful to the biologic life of the soil. The phosphorous is absorbed into the plant but the sulphur remains in the soil where it interferes with the free functioning of its biologic life.

The Hunza land is irrigated by heavily silt-laden waters which deposit a thin film of precious minerals over the already fertile soil. These silts are finely ground up rock detritus made by the pulverizing action of the glaciers which dominate the Hunza landscape. They also remove the rich silt from the silt traps of the channels and mix it with the litter of their cattle which eventually finds its way back to the land. This silt probably contains valuable minerals which the Hunzas are most fortunate to have to supplement their manure and other organic matter.

Now we must come back to our geology lesson again. Every farm has an underlying bed of rock from which the soil has formed and it has recently been found that a certain importance attaches to the nature of the rock which happens to underlie a particular piece of land. Miscellaneous Publication No. 369 of the U. S. Dept. of Agriculture, *The Mineral Composition of Crops*, goes into this subject in great detail. If the soil is of granite, sandstone, aplite, pierre shale, cretaceous, pumice or rock of volcanic origin, then it is inferior for the growing of crops. It seems that cattle when pasturing on such soils will come down with diseases that are not visited upon cattle that feed in pastures growing on soils deriving from limestone, phosphate rock, basalt, dolerite, diorite and gabbro formations. This first group is more or

less acidic and in many cases contains large amounts of potash.

The most outstanding case mentioned by Bulletin 369 heretofore mentioned is in reference to a certain section of Florida in which the soil derives from Leon Sandstone. Ninety-six percent of the children in this county suffer from nutritional anemia. Six miles away, only three percent of the children are subject to anemia, because the soil there lies over a phosphate rock formation. This book is not the proper place to give too much detail on this subject but it is terribly important and further research must be entered upon to determine how the agronomic world is to deal with it. But in passing, reference might be made to Deaf Smith County, Texas, which has been called *the county without a toothache,* because very few persons there have trouble of any kind with their teeth. It has been found to be due to an underlying geologic formation extremely rich in lime and phosphate, with small amounts of fluorine, an element that is needed for good tooth formation. Similarly the Bluegrass regions of Kentucky produce fine, big-boned horses because of a good geologic under-structure.

The fact that the Hunzas raise food of such exceptional nutritional quality and that their neighbors do not led me to feel that possibly the underlying rock structure might be one of the causative factors. I have read dozens of books about travel in Northwestern India and was constantly on the lookout for references to the geologic structure of the regions surrounding Hunza. It was interesting to note the general prevalence of granite rocks. Knight says, "The country round this spot is particularly dreary—a howling wilderness of granite boulders." He says again, "Ladak, like Chinese Tibet, is for the most part a desert of bare crags and granite dust." Later on he states, "Surrounded thus by granite precipices and huge wastes of ice and snow. . . . Hunza-Nagyr has but one vulnerable point." In his writings we meet other references to "granite precipices," "granite sand," etc. Bear in mind that Bulletin No. 369 has shown that diseases frequently occur on granite land, but to a far less degree on limestone land.

Jenny Visser-Hooft in her book said, "We pushed on with greater speed, breathing heavily, for we were above 16,000 feet and . . . at last we caught sight of our goal. Before us lay an extensive basin, filled with ice and surrounded on three sides by steep walls of granite; here was the spot where the snow of the Batura accumulated, before it embarked upon its lengthy journey downwards to the Hunza valley."

McCarrison in his *Etiology of Endemic Goitre* said, "In the eighty miles of country between Gilgit and Astore there is hardly a village in which goitre is not common, and often cretinism also, yet the whole of this country is made up of an igneous complex composed of several varieties of granite." This region adjoins Hunza.

I do not want to burden you with more quotations on this point but the writings are full of such expressions as granite blocks, granite boulders, granite ridges, rent granite masses, granite peaks, granite debris, etc. You cannot fail to be impressed that this part of the world is predominantly granite.

Yet I felt that the Hunzukuts must have a better geological background than their goiterous Nagyr neighbors across the river. The News-Letter on Compost, published in Cheshire, England No. 9 refers to the great mountain of Rakaposhi as "the great white limestone mountain which dominates the valley." This was interesting but not authoritative and attempts to ascertain the exact geologic formations at Hunza and Nagyr did not bring fruit. I was certain, however, that there was a sharp difference in the rock structure between Hunza and Nagyr.

I believe the answer is contained in Mrs. Lorimer's book. I am going to reprint the particular portion I have reference to and see if you can guess

what I am trying to prove. But in doing so bear in mind that granite is an extremely hard rock, while limestones are much softer. She said,

"As we scrambled our way along through the riverside boulders we noticed dozens of discarded millstones, some broken, some apparently perfect. Not that people bring their old millstones here to cast away! The opposite cliffs at this point happen to provide the best type of stone for mills, and, oddly, those on the Hunza side make the better nether millstones and those on the Nagir side the better upper ones (or it may be vice versa. David will have it accurately noted). When you want a new millstone you travel your ten or twenty miles or more to these cliffs, choose what seems the most promising boulder for your purpose, and with a rough bit of iron hack and chip it into a circle of the radius and depth required. You then bowl it home your ten or twenty or more miles like a child's hoop, up ravines and across gorges to your mill. If it hasn't broken as you fashioned it, which it frequently does — this explains the number of discarded millstones that here strew the countryside—it may very likely break on the rude road home. If so, you just go back and carve yourself another. A note of bitterness crept into the Hunza voices. Whereas Hunza permits the Nagirkuts to cross the river and help themselves free to Hunza stones, the Nagir people levy a tax on all stones taken from their side."

Of the two millstones, the upper one, or the "runner" rotates while the nether one is stationary. The "runner" should be the harder of the two stones as it wears out faster. As Mrs. Lorimer has said, "oddly, those on the Hunza side make the better nether millstones," because, no doubt, they are of softer rock, while those on the Nagyr side are harder. Is it possible that the Nagyr rock structure is of granite?

Granite does not disintegrate as quickly as limestone to give the soil the benefit of its mineral ingredients, and some of its make-up is of a questionable nature, such as its potash. It is also acidic. There is sufficient evidence to prove that the oversupply of potash in some rocks is detrimental to the healthy growth of crops. I noted from a study of Bulletin No. 369 that not all types of granite rock were bad actors but I did not have sufficient training to read the geology and mineralogy textbooks so as to get at the bottom of various rock analyses.

In the summer of 1946 I presented myself at Muhlenberg College, in Allentown, Pennsylvania, and asked to be enrolled in their eight week course in Elementary Geology. Professor Meyers informed me that their regular course wouldn't suit my needs.

"I'll tell you what I'll do," said the professor, "I'll give you a special course and we will call it Geology Special. You will be the only student in the class." And so it was arranged. Here I was back at school again and I must say I enjoyed it hugely. The professor must have been impressed with my intense desire to learn and did everything in his power to help.

For two months I reported four days a week, for two-hour periods. Professor Meyers sat at his desk and lectured to me. Then we would do laboratory work, scratching rocks and making various tests. We went to quarries and studied the local terrain. In a short time I had obtained a smattering of elementary geology, but sufficient to enable me to read geology books and bulletins half way intelligently.

Now I set to work analyzing Bulletin 369. I found that the potash in granite rocks was contained in the feldspar but that there were two kinds, an orthoclase and a plagioclase feldspar. The orthoclase was high in potash, the plagioclase low. Where the granite contained the feldspar in the plagioclase form the records showed that it sponsored better crops than if it contained it in the orthoclase form. In other words there was something about potash that must be looked into further. Horticulturists are aware of the fact that plants are intemperate

when it comes to the intake of potash. They do not know when to stop.

This case against potash ties in with the researches of P. Schrumpf-Pierron, who showed that human cancer was greater in regions where the geologic formations contained excesses of potash.

Before leaving this subject I want to give one more instance of a case under granite soil conditions. Note that in the following, which is reprinted from Sir Robert McCarrison's *Sixth Mellon Lecture*, delivered at the University of Pittsburgh in 1921, he is referring to twelve Hunza families which attempted to colonize in a neighboring section overlying a granite formation:

"It is not that the races to which I have referred live under hygienic conditions superior, as to housing and conservancy, to those of the masses in the West. On the contrary, in both these respects their conditions of life are most primitive. Nor is it that in their agricultural struggles with Nature they have acquired any peculiar immunity to the effects of faulty food; they are, indeed, as susceptible as others to these effects, as the following occurrence illustrates: It fell out that the cultivable lands of one of these races were no longer sufficiently extensive for the increasing population. To meet this it was decided to colonize another tract which had never previously been cultivated. A dozen families were settled there, and they made shift to grow upon its granite and infertile soil such grains as they could. My attention was directed to their efforts, and more especially to the results of them, when ten out of twelve adult young men developed paralysis of the lower limbs due to lathyrism—a rare malady resulting from the disproportionate use in the food of the vetch *Lathyrus sativus*. These settlers, finding it impossible to grow a sufficiency of wheat, had cultivated the hardy vetch and used it in too high admixture with their scanty stores of wheat. The result was the development of paralysis of the lower limbs among the male population, while the female members of the settlement were unaffected. I mention this dramatic occurrence to show you that perfect physique and stability of the nervous system did not protect them from the effects of faulty food."

I am sure that the Hunzas have a good geologic heritage but beside that, their general intelligence has made them conscious of the value of the glacial silt as a soil amendment. Dr. Wrench has stated that the Hunzukuts use alkaline earth from the hills which they spread on the land on days when the fields are watered. This shows that their mountainside is limestone or some other type of rock which is alkaline and thus beneficial. In the United States we have billions of tons of rocks of all kinds. It is endless. It is cheap. It must be studied and we must arrange that a proper mixture of it be made in powder form to supplement the manures and composts for our lands. We should put the equivalent of the Hunza sediment on *our* lands.

In concluding on this subject permit me to say that my thoughts on the Hunza geology are pure speculation, which may be proven wrong, but of one thing I am sure, that the powdered detritus, which flows on to the Hunza land, and which comes from the surrounding mountainside, is a significant factor in the outstanding results obtained by the Hunzukuts.

J. I. RODALE.

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After the Earthworm The Toad

BY

DR. EHRENFRIED E. PFEIFFER

ABOUT 110 years ago, English gardeners who brought their products to the market places would find there salesmen who raised and sold toads. There was quite a lively trade in toads going on at that time, not only in England but also on the Continent, especially in Belgium. It seems that toads were "planted" in truck gardens because it had been observed that the toad trodden soil produced better and healthier crops.

Another "superstition" would be the opinion of our modern agriculturists. That this was not a superstition may be proved by the importation of one of the largest toads, Bufo marinus, or Jamaica or American Tropical Toad to Hawaii in 1932. C. E. Pemberton reports in 'The Hawaiian Planters' Record, Vol. XXXVIII, No. 1 & 3, 1934, a thorough, scientific publication of the Hawaiian sugar cane planters, how he brought toads into Hawaii in order to combat insect pests. The toads were famous for their tremendous appetite devouring insects in the sugar cane cultures in Puerto Rico. One hundred fifty-four toads were collected of which 149 arrived in good condition in Hawaii. These have since multiplied and have become valuable hunters of insects. They were 13 to 19 days enroute with no food at all and must have welcomed the new home and hunting grounds. At first, for a few years, they remained inconspicuous and then appeared in great numbers, increasing rapidly thereafter. A substantial decrease of damage by changa (mole cricket) and white grubs has been observed as a result of this involuntary transplantation. "This toad will eat almost any insect that comes within its vision, which includes beetles, moths, wasps, flies, caterpillars, mosquitoes, etc," reports C. E. Pemberton.

In 1716 Peter the Great bought a collection of toads for 15,000 guilders. The Bufo marinus is a giant toad, but there is no doubt that also our native, smaller, northern variety, Bufo vulgaris, as used by the English gardeners, is a very useful helper. Toad hatcheries have been started in Hawaii and it has been estimated that the animal eats about 1000 to 2000 insects until fully grown. "We have fed them grasshoppers, armyworms, beetles, earthworms, scorpions, wasps, moths, bees, house lizards or geckos, ants, many sorts of caterpillars, snails in the shell, cockroaches, and sow bugs or slaters; all of which were taken with little discrimination." We read further, "A female bee of the same species was later given to the same toad and was also immediately snapped up and passed down the insatiable Bufo gullet with ease. This large black carpenter bee, so commonly found boring in redwood fence posts and other wood structures in Hawaii, possesses an exceedingly powerful sting which is used effectively at the slightest provocation. Undoubtedly the bee will continue stinging, for a few moments at

AN ALLY IN THE GARDEN

least, after passing suddenly into the interior of a toad. It is astonishing that a toad will, without hesitation, gulp down a bee possessing such a formidable weapon of defense and apparently suffer no discomfort. After swallowing such a fiery creature as a carpenter bee, Bufo was observed to execute a few abdominal motions suggestive of the Hawaiian "hula dance." Spiders are always eaten with relish if they come within reach of the lightning-like flash of the toad's tongue. Dr. Williams found that freshly decapitated centipedes, which are still able to crawl, are eaten apparently without fear of injury; but the many legs of centipedes are usually able to cling over the mouth or head of the toad so tightly that the process of swallowing such a long object is often accomplished only after much laborious gulping and pushing and pawing with the front feet in a very human but 'inelegant' manner."

One important feature about the Jamaica toad, however, escaped the attention of the research men in Hawaii, and that is the fact that the toad has glands in the skin which excrete a tremendous amount of adrenalin. In fact, the Jamaica toad contains four times as much adrenalin as an adult, full-grown human being. We know that adrenalin is an important stimulating factor in human life. Adrenalin also stimulates plant growth. So we have another factor, aside from the fact that the toad devours insects, namely that wherever it touches plants or seeds or even soil, it adds adrenalin and probably other growth hormones to the soil and plants. Unfortunately this feature has not been investigated as yet. But here it links up with the old English experience. There the toads were not bought and used so much as an insect control, but they were bought because their growth stimulating factor had been observed,

and it was seen that crops did much better when toads were around. I have come across this characteristic years ago when I was first invited to visit the farm of a biodynamic farmer in Maryland. This gentleman had quite a row of compost heaps. Some of them were made in a very untidy way, old fashionedly, that is, in comparing them with the properly-set-up compost heaps, in layers as we described it recently. I was asked to find out which of the heaps were biodynamically treated and which not. On the surface, all the heaps looked alike because they were all covered with a thin layer of earth. Now in our composting procedure we prescribe a kind of pit under the heap for aeration and the collection of water. And in going around these heaps I observed that in the case of some of the heaps toads were sitting in those holes, in others not. Remembering the English custom, and also some other observations which will be reported later, I guessed that the heaps where the toads were, were the properly treated heaps. And in fact, this was true. Evidently these toads preferred those heaps for their residence. In other words, whenever you find toads in or near a compost heap you can be sure that these compost heaps will be in perfect condition.

Now, stimulated by all these observations of toads, we made certain experiments before the war on the biodynamic farm at Loverendale, in Holland. The experimental gardener there kept a toad and had a special box where this toad would live, similar to the earthworm breeding boxes. The toad would always return to this box and became so tame that it followed the gardener when she walked around the garden beds. It was used to the name Fritzi and when we called "Fritzi, Fritzi!" then indeed this toad would hop on the path so that it could be seen. The earth which was trodden by this toad, in the box, was used for plants, for seed germinating experiments, as well as for plant growing experiments. And we observed that the particular growth stimulating factor which was excreted by this toad probably in the form of a kind of mucous, adhering to the skin, and also in the excrement and urine of the toad, gave an increase in growth in germinating quality of seeds, that is a seed which probably germinated only 75 to 80% would increase to 95% germination or even to 100%. The plants would also grow faster and taller. Unfortunately the records of these experiments have been lost during the war and so I must quote from memory. We made quite a bit of use of these toads, and the earth from their boxes, in order to carry on seed breeding experiments. We also observed a beneficial influence here. In other words, in addition to the beneficial influence of the earthworm on the formation of humus in the soil, we have in the toad an animal which adds growth stimulating factors to the soil.

The toad-trodden earth was diluted with water, suspended, and even these dilutions, 1 to 1000, still stimulated plant growth and seed germination. This is where future research has to start, in order to find out more details, and probably one day we will be able to call the substance which is secreted by the toad by its proper scientific name. If one talks with old farmers and gardeners in Europe in the very old fashioned areas one always finds a willing interest when the talk turns to toads. To them there is nothing new about it, they all are familiar with these effects of the toads. This is another case where science could amend its opinions, namely that "superstitions" are not always superstitions, but there is some reason in back of them.

The toad, as an environmental helpful factor in plant growth, particularly in organic gardening might become an important item for the future. Much still has to be investigated in this field, but we do not doubt that there will be a good reason that later on, besides the earthworm cultures, one will also start toad cultures again, in case there are no toads around. The

toads live in a certain area in which they move freely, and if the table is set for them they are rather punctual in coming to the feeding place. They will live also on relatively dry land, in waste lots, and in cultivated gardens, once they feel they are liked there and well-protected. Of course, for propagation they need small ponds, or basins, where the tadpoles can develop. But after they have laid their eggs, 10 to 15 thousand per toad a year, the tadpoles have developed and changed into toads, they are rather independent. We had quite some fun with Fritzi, she or he, we never could find out which, was rather a Lone Ranger. It did not like other toads. Now one day we caught another toad and thought Fritzi was so alone and should have a mate. Probably we didn't hit this right because they started to fight and they would stand up on their hind legs and really dish it out with their front paws. It was quite a sight I can tell you. A boxing match between Joe Louis and his recent opponent could not have been much better.

There doesn't seem to be any age limit in toads. In captivity they have been kept for twelve years and still were full of vigor. They have a long tongue which they shoot out of their mouth when they see an insect; and can "pick up" this insect at quite some distance. It seems that they can pick up an insect even at a distance of two to three inches. They will sit there and watch the insect for awhile, a fly for instance or a beetle settling, and suddenly the tongue shoots out to the insect, glues it to the tongue and takes it back to the mouth. The whole action is so quick that you just see that the insect has disappeared and the toad looks very satisfied. In fighting with others, besides hand work, they also spit. Even this saliva, as has been proved with our experiments, has a growth stimulating effect on plants, even though it might not be so beneficial for animals, small animals in particular. Some people complain that they get an itch or a kind of eczema from touching toads. This is possible, but neither the gardener nor the author ever suffered from it as a result of handling the toads. If one is sensitive in this respect one might use leather gloves. Toads will not breed well in an enclosed area, for instance in a box. They can be kept there after they are grown or half grown, and even if set free they will return to such a place as a hiding place. It is necessary to give them a rather large area. In our experiments we had the breeding box in a space about ten by ten feet, rather ten by thirty feet, fenced in with a small wire fence of screening. We called this our toad garden. They hibernate in compost heaps, as was seen, and it would be wise, as soon as one discovers toads near the compost heaps, not to open those heaps before the spring season has started. It is superstition, however, if people think that toads are bearers of evil, or have an evil eye. There is no such thing, and it is only the fear of people who out of ignorance that persecute the toad. They can become friendly and companionable, not necessarily house pets, but true friends of the gardener. Protect your toads is the good advice we can give to you organic gardeners.

The Fruit Orchard, 25 cents. **Sunflower Seed—The Miracle Food,** 25 cents. Order from Organic Gardening, Dept. Z-1, Emmaus, Pa.

Figure A
WITH HUMUS

Figure B
WITHOUT HUMUS

CAN AMERICAN AGRICULTURE SURVIVE THE STORM?

Louis Bromfield of Ohio, J. I. Rodale of Pennsylvania, and Neil Martin of Alabama, Demonstrate What Can Be Done to Prevent Soil Depletion From One of Our Worst Enemies —Erosion.

Observations by
HERBERT CLARENCE WHITE,
Director, Institute of Country Living,
Paradise, California

DURING the past summer it was our privilege to travel and visit in many states—all the way from the Pacific Coast to the Atlantic Seaboard —25 in all. This tour, lasting two full months gave us a new concept of the term, "The Great American Desert." Shocking it is to the lover of "the Good Earth" to find so much of our wonderful "Land of the Free, and Home of the Brave" in a condition of partial, if not total desolation!

Nothing that the Biblical Prophets of Doom ever wrote about the fate of the once fertile plains of the Tigris—seat of erstwhile world empires—could possibly picture scenes of greater desolation than we witnessed on this tour of "America the Beautiful."

Why is it that agriculture—that bulwark of civilization (for without it, civilization ceases to exist) has become "unstable"? Why is it that with all our scientific knowledge, so little of our precious water remains on the land where it falls, to bless and nourish it?

By what caprice of fate has our rainfall (of which heaven has no greater gift to American Agriculture) been turned into a wild, ravenous beast—tearing at the very vitals of our economic life, our health, and our national existence?

That, according to the editor of LIFE Magazine in his August 4 Editorial, is the $64.00 question facing every American farmer; and not the

Figure C
SWEET POTATOES ALSO RESPOND TO HUMUS

farmer only, but every lover of the soil, and that ought to include every red-blooded American.

"Hundreds of millions for flood-control" is the cry that goes up from our honored President, and from our astute legislative assemblies, as they witness this "major hemorrhage" of our continent, and are face to face with the problem of whether we are to "have a permanent or just a temporary country."

And again we are reminded of E. H. Faulkner's timely warning, that in agriculture "we create our own problems for the doubtful pleasure of solving them." After all is said and done, flood control is purely and simply an agricultural problem. This wild "run-off" that carries our life-sustaining topsoil into our muddy rivers, and thence into the sea—this EROSION we hear so much about in the papers and over the radio, is purely a matter of *bad farming*.

Correct agricultural practice—a return to sound principles of soil improvement, including a restoration of the humus content of the soil and an adequate earthworm population would automatically solve to a large degree the problem of "run-off" and consequent erosion, and the dangerous lowering of our water-table, as well as the disastrous floods with their incalculable losses to our national economy.

If the $600,000,000 that has been proposed by our leaders in Congress, to be used in flood control and soil conservation, were devoted to building an earthworm populated, humus filled, bacteria rich topsoil on American farms, the problem would at once be solved at its source. Patrick Henry said: "He is the greatest patriot who stops the most gullies," and Patrick Henry knew something about patriotism, says LIFE Editor John K. Jessup.

In my humble opinion, the best and smartest, and most effective way to "stop gullies" is to *prevent them from starting*. And nothing more or less than organiculture will do just that. Some "doubting Thomas" will immediately say, "Where is your proof? How do *you* know so much about the *cause* of erosion, of gullies, of soil depletion?"

ME? I don't claim to know anything. But there *are* men who KNOW from experience just what this rejuvenation of eroded, washed out, depleted soil will do in solving the problem of "run-off" on American farms; and when you have solved the problem of "run-off" you have solved the problem of "flood-control."

Among them are men like Louis Bromfield, who, over a nation-wide radio broadcast not long ago said: "There is not one ounce of 'run-off' on any of my farms." And if you have lived or traveled in that rolling, if not hilly countryside near Mansfield, Ohio, you will appreciate the achievement indicated in Bromfield's claim. J. I. Rodale, with his experimental farm in the rolling Lehigh County terrain near Allentown, Pennsylvania, will tell you the same thing.

And last, but not least, is the near-miracle in soil restoration that I witnessed last month (August, 1947) on the farm belonging to the founder and superintendent of the El Reposo Sanitarium, in the rolling environs of Florence, Alabama.

For seven years, Neil Martin, pioneer in American organiculture, has been loading the red clay of his eroded Alabama farm with HUMUS—leaves, grass, weeds, peanut hulls, straw from nearby farms, cotton wastes, animal manures—all have gone into that old worn-out farmland. Result?

On Neil Martin's hilly farm there is *no run-off*. Erosion is a thing of the forgotten past. Here is his testimony: "After the third year of organic gardening practice, there was no washing or broken terraces. No muddy water *ever* runs off the place." What is even more remarkable, no water, even in the lowest spots, stands for more than an hour, after the heaviest downpour!

My theory is, that if these men *have done it*—every other American farmer *could do it if he would*. It is largely a matter of education. Sir Albert Howard tells us that agriculture "has taken

the wrong road." The question is, are we willing and humble enough to learn? Give the organic gardeners that $600,000,000 and they would go a long way toward "building a new country!" concerning the rightness of these fundamental principles of correct agriculture. Whereas the countryside was literally "burned up"—with thousands of gardens and farms as desolate as the Sahara desert, these organic farms were in the pink of condition, without any additional rainfall or irrigation.

Why was Neil Martin's corn "standing up" during the devastating drought, while his neighbors who were following the accepted "scientific" procedures, faced a total crop failure? Why was Martin's corn a rich, deep green, while his neighbor's corn across the fence was seared and withered and brown? Why was Martin's corn eight to ten feet high, while his neighbor's across the road was barely waist high? Why did Martin's stalks bear from two to three ears, while his neighbor's were bare—without any fruitage whatsoever?

Both fields had the same amount of rainfall during the early growing season. Both were subjected to the same sweltering, blistering summer heat. Both passed through the long drought without irrigation of any kind. What made the difference between outstanding success on the one hand, and absolute, total failure on the other?

There is only one answer — HUMUS! When the crisis came, the organic farm prospered and did exploits. The moisture-retaining humus, the earthworms, and the friendly soil bacteria came to the rescue and saved the day! (See Figures A and B.)

We also observed the same near-miracle in two crops of sweet-potatoes. The one on the Martin farm was lush and green—the neighbor's across the fence, yellowed and spindly—barely visible among the weeds in the row. In contrast, Martin's patch had such vigorous growth the identity of the rows was completely lost, for the plants had closed up into a single mass of deep, living green. (See Figure C.)

I asked Neil Martin to "give me the dope" on chemical vs. organic fertilizers. He summed it up in a few easy words that I want to pass on to all the readers of *Organic Gardening Magazine*:

"When two crops are planted at the same time," he says, "the chemically fertilized plants come on faster, and perhaps they will bear a little earlier —but they begin to deteriorate within a few weeks. If hot, dry weather comes, they 'pass out.' On the other hand, a crop grown the organic way, using compost as fertilizer, may start bearing a little later; but it will produce an abundant harvest of superior quality until frost hits it in the fall in spite of possible adverse weather conditions."

On this remarkable little farm, no commercial fertilizer has been used since 1941, and no so-called controls have been used since that date—no sprays, no dusts, no powders — and there has not been a single crop failure of any kind for over five years!

Within these seven years, a worn-out, dying grape vineyard has been completely rejuvenated. A brush fire went through the vineyard nine years ago. The canes were badly scorched, resulting in disease. There was no crop until one year after mulching. Now, nine out of ten canes are perfect. The crop is heavy and has superior flavor and keeping quality.

Besides feeding from 25 to 30 persons a day (Sanitarium guests and staff) Martin sold over $500.00 worth of excess produce from his little farm this season. Seventy-five per cent of the fruit and vegetables served at the institution were home grown. "We have stuff out of the garden nearly every day in the year, and we can in excess of 4,000 quarts of fruit and vegetables each year," declared this enterprising humanitarian.

What more could any man do with a little chunk of "no-good," worn-out, eroded land? My hat is off to Neil Martin and his sons! Wish we had more farmers like them!

The GLORIOUS IRIS

Flowers of the Iris have the beauty and dignity of orchid flowers.

By M. B. CUMMINGS
Professor Emeritus,
University of Vermont

IRIS is among the best of plants for the home garden. For the busy gardener, the amateur, and all others, there are few plants, if any, in its class. It requires but little care and gives much pleasure. Its orchid-like flowers, not so delicate but often as well perfumed; its rainbow and sword-like leaves give beauty and dignity. These many attributes together with good health and hardiness, make iris an outstanding plant. It is relatively permanent, lasting unmoved for several years. The blossoming season may be as early as May, as with Christata; and as late as August or early September as with Vespers. Irises may be seen also in June and July, following the tulip and preceding the peony and rose.

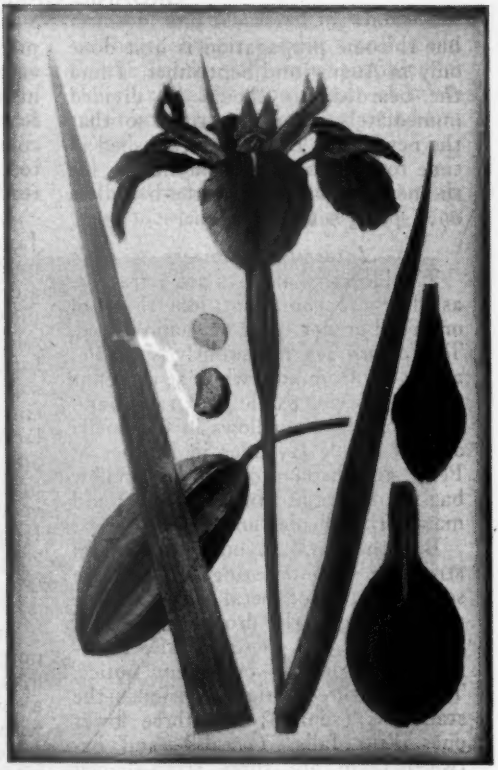
Grows Anywhere

For the busy gardener who has little time for labor, but wants good plants, there is nothing better for the home garden or the hedgerow, or even the border than some of the better species and the newer varieties of irises. Many of them, especially the German types, will grow on any soil and may be planted from August to October. Spring planting is not advisable. It is a great convenience to have this latitude of "setting out," for then it can be done in free time, as it occurs. The iris is sometimes called the poor man's orchid.

Much Variety

There is much variety among irises. They can be had in a range of color and form equalled by few hardy perennials; they are tolerant of many adverse conditions and are subject to attack from only a few diseases and insects. There are about 200 distinct species in the world including the wild ones and there are hundreds of varieties. The European species, Iris germanica, often alluded to as German iris, has given rise to several thousand varieties of hybrid forms, and this type is of great horticultural

for Every Garden



The flowers of some species of Iris are most delicate. Here are shown a flower and its parts—a sepal, a petal, a fruit, and a seed.

interest. It is a far cry from the wild flag, Iris versicolor, to the new varieties such as Emperor and Doris Childs; and nearly all of the intermediate types can still be found to connect those of early days and those of today, to show improvement and development.

Easy to Grow

There are no intricate problems in growing irises—all is easy. Most any soil and exposure will be tolerated—full sun or partial shade can be withstood. But deep planting is likely to cause stem rot. Partial exposure of the bulb or rhizome does no harm, even on dry soil or in summer heat. But weeds need to be suppressed. Fall and winter mulching is not absolute, and is seldom given.

Use of Seeds

It is easy to get new plants from seeds of wild forms and not difficult from garden varieties, but in the latter case there is no certainty of exact reproduction. The best time I find to plant the seeds is immediately after they have ripened and have been harvested. When the pods begin to turn yellow they should be watched and as soon as they begin to crack, gather them. I remove the seeds from the pods and let them dry for several days, then plant them. The seeds of most kinds germinate the next spring. The planting of seeds can be done in the open garden or in pots in a frame, the latter being preferred if there are but few seeds. I cover the seeds to twice their diameter and prick them out after germination. The beardless species require two years to blossoming time.

Rhizome Propagation

The easy and common way to propagate is by division of the rhizome —the underground fleshy stem, as garden seeds will not come true from seed. Many can be increased by division of the roots, although the rhizome is more common. This is done about once in three years. An iris rhizome grows along with an annual extension until it produces its terminal flower stalk. As a rhizome is really a stem, it bears dormant buds. A good block of rhizomes from three to four inches is taken by separation; and slicing the blocks gives good sizable portions for reproduction.

A convenient way, I find, is to lift the whole clump, then divide it after shaking out the soil. Plants can be moved any time with due care,

but rhizome propagation is best done only in August and September. I find the bearded iris should be divided immediately after flowering, so that the new pieces may get established in time to produce embryonic flowers for the next season; but for the beardless ones spring is the best time.

Interesting Flowers

The blossoms of irises are attractive as they are somewhat like those of orchids but not quite so complicated. The colors are numerously variable; and range from pure white as in Venus de Milo to violet blue in Pyramid and on to handsome yellows in Citronella and to a pale lavender in Mother of Pearl; and then on to a red on a yellow background as in Mme. Chobaut; and many other shades and types.

But the petal layout and general structure is interesting. There are several types of petal disposal—the nearly upright, the drooping or "fall" as denoted; and there are also intermediate types as one may notice. There are three upright divisions—the standards (sepals); and three lower ones, "the falls" (petals)—and between them are three strap-shaped divisions known as styles. I like the flower structure. The bearded petals and beardless sepals seem to puzzle some amateurs. The hairs are generally on the "fall" petals which together with lines seem to be a device for bees, guiding them and only slightly obstructing their passage as they enter for nectar. The bees must of necessity brush against the hairs in making their entrance and exit, and therefore mix and distribute pollen, a necessity in cross pollination for seed setting. Cross pollination—be it natural or artificial, is the only means of getting new varieties, a process that accounts for a wonderful development of the modern garden iris. Infertility is the normal rule, hence crossing becomes a necessity for seed production.

Many Varieties

As one scans the catalog lists he may be surprised at the large number of varieties available, he may even be puzzled to make selections; but nurserymen are usually cautious in recommending varieties. A few outstanding features such as season of flowering, color of flowers and the height, seem to suffice. One needs to grow irises to really know and appreciate them.

Recently the oriental iris from Japan known as I. Kaemferi has been much featured. The flowers are large and flat, rich in colors of white, red, pink and blue. It blossoms in June and July, one year from seed. This form does best on rather heavy moist soil that is rich. It is excellent for cutting. The Matterhorn is a very large pure white flower, and is much admired. City of Lincoln has a very fine clear vivid yellow with rich velvety red on its flaring falls. Autumn King has a blue-purple flower in bicolor and of good size. Indian Chief is a fine red with pinkish red falls and is conspicuous.

Indian Hills has clear rich wine-purple petals with large flowers which make a fine mass effect. Exclusive is a good blue in pure light color overlaid with a silvery mist giving a sort of powder blue hue. Universe is a beautiful six-petaled variety of large size with long stems and flowers in cerulean blue with golden center and white halo with white lines. In this variety the standard is tipped with blue. It has a long blossoming season. Ma-mie is a rather tall one that is frilled white with pencilled falls. It blossoms in midseason. The common blue flag—Iris versicolor, is worth having in small quantity for its historical interest. It blooms profusely and has many bright colors. It will grow anywhere, but does best in moist places.

Among the gold medal varieties are Ambassadeur, a pearl pink one with deep maroon falls; Bridesmaid, a light lavender, has white falls; Lent A. Williams, a violet and purple one, has large flowers, yellow beard, and tall strong stems. And of those considered rare are Coronet, a soft rose-beige with a golden tone—a color entirely new; Treasure Island is a giant clear yellow; Missouri is a large-flowered, medium

blue, fragrant and with petals broad, hard and heavy. Then among an imperial dozen are Coronation, a large rich golden yellow form, tall and of midseason; Pink Satin, a pink-toned, large, tall, smooth plant of fine color; Dauntless is a rosy red, tall and of midseason. Maple Waterfall is unique in being doubly variegated, is rosy-crimson, and feathered in white. The tall bearded seem to have a preference. So the list is really inexhaustible; for there are many more kinds of much merit and new ones make their advent every year.

Points of Culture

Irises should not be crowded among other plants that mat closely to their

The Irises are especially adapted for the spring border and associate well with violets as shown in this reproduction.

roots; for they need air, sun, and space for roots.

Plant the rhizome half covered and half uncovered. Cut back by August the old tops to a single fan of leaves, three or four inches tall. Bulbous forms are planted deeper than rhizomatous ones. English, Dutch and Spanish iris grow from bulbs.

After blossoming, clip off all dead flower stalks. Tie muslin over seed pods to exclude worms. Shallow rooted first year plants need a little winter mulch.

In double border planting, set the low ones in front or at the edges with taller ones at the rear or in the center. Choose harmonizing colors.

A careful selection of varieties will give a long blossoming season; and is one of the satisfactions from irises. A fall as well as a spring blossoming variety known as a "repeater" is Eleanor Roosevelt.

Crossing for New Varieties

Hybridizing irises for new varieties is a fascinating procedure. One needs to select the parent varieties with much care and be reminded that surprises are likely to occur. H. T. Coe of Putney, Vermont has been a devotee of irises for twenty-five years, testing new varieties and creating new ones. He gives full sun and soil well enriched with organic matter, and uses no lime. He mulches with leaves the fall sown seeds. Coe gets a good thrill in raising seedlings and watching the flower buds as they begin to show color. He finds the bearded forms set but few seeds and their pollen is not very fertile. With parents selected for crossing, on a sunny day he takes tweezers and gets pollen from a stamen when ready and dusts the pollen on the inside of three little lips that are on the underside of branches of the stigmas to accomplish fertilization. Seeds are planted in September and germinate in May. Sixty per cent will grow. These are moved to a permanent bed with specimens a foot apart. Coe finds that Japanese irises like Emperor and Doris Childs, are prolific seeders. There is a satisfaction in growing irises from seeds that one does not know until he tries it.

Among Coe's most interesting varieties are Bruno, a bronze red, large in size, of good form and texture. No-weta is an attractive pink and yellow form. Betty Holmes is a fine white which grows to nearly four feet tall with eight inch flowers. Mrs. George Stumps is also a large white one with small purple standards and is low growing but strong. Pink Petal is iridescent, tall and large; and Pyramid is large and purple with some yellow at the center. Then, too, there are Cloud Summit, a warm white flowered one, and Blue Lagoon, a fine clear light blue one, both of which add much to any selection. Coe limits his varieties to about ten.

Insects and Diseases

Iris has but few enemies. In general it is a healthy plant. There are, however, a few insect pests and two diseases that occasionally need attention. The iris borer that injures the rhizome heads the list of insects. It is injurious and favors rot of the tube. Eggs for the borers are laid near the basal leaves, and hatch in early spring. As the worm increases in size it works down the rhizome, eating out a channel. In early stages the borer's presence may be recognized by a wet stain along the edges of the leaves followed by a ragged appearance. Digging out the rhizome and destroying affected plants are the only effective means of control. Watch for borers at propagating time and when new plants are set. This is important.

Soft rot of the rhizome, a bacterial disease, sometimes causes a rotting of the fleshy rhizome. All kinds of irises seem to be susceptible to this disease. The first symptoms are a browning and withering of foliage accompanied by a water soaked appearance at the base of the leaves. A cream colored ooze may appear in the fleshy stem and there is a foul smelling mass within the skin. The only control is to dig and destroy all affected plants, and

Irises, particularly the dwarf varieties are effective border plants for driveways and walks. They look well with tulips and chickweed.

take sanitary measures with all others that can be handled in the dormant season. Keep the soil well drained and avoid all means of spreading the disease.

Leaf spot is fairly common on German iris, but it is not a serious disease. On the upper half of the leaf there may be elliptical reddish bordered spots, dotted with black specks. The fungus lives over the winter on the dead leaves, hence they should be destroyed, when there is leaf spot. Thus it is seen that iris escapes the dozens of enemies that affect many garden plants.

Wounds treated with the paste heal quickly.

Tree Paste

By JUSTIN BRANDE

A B

A. A twig with leaves from an untreated tree.
B. A twig with leaves from a treated tree.

I should like to tell briefly about the results obtained on some old apple trees with the use of a natural "tree paste." I first heard about this preparation and a great many other things of a like nature when I worked with Dr. E. Pfeiffer on his farm in Chester, New York. Since then I have seen a few references to a similar treatment in old books on husbandry, notably in Forsyth's *On Fruit Trees*, published in this country at the behest of William Cobbett about 1820. I suppose we were too lazy to pay much attention to such men when they recommended such things, though to be sure we do twice as much work to-day with a variety of sprays just trying to hold the bugs and blights in check.

Essentially this tree paste consists of two things: one half clay and the other half fresh cow manure—mixed with enough water to make it of about the consistency of warm molasses, so that it can be applied with a stiff brush to the trunk and such branches as can be reached. Dr. Pfeiffer and those practicing the Biodynamic method recommend the addition of their preparations 500 and 508 (See their booklet entitled *The Treatment of Fruit Trees, Berries and Shrubs.*). Forsyth added some bone meal and woods ashes. For my part, I added about a handful each of hardwood ashes, rock phosphate and ground limestone to each bucket of paste. Inasmuch as one of the orthodox methods of doctoring sick fruit trees is to inject under the bark or to spray on the leaves a solution of the specific mineral in which the tree seems to be deficient, I added these other items, in order to be sure of adding just about all of the elements in the Periodic Table in addition to the "vital" elements supplied by the basic mixture. The trouble with the orthodox method, of course, is that you have to wait for the tree to get obviously sick before you can ever begin treatment. I am not sure whether it was necessary to add the additional items to the basic mixture, but I am sure that this treatment is one that promotes positive,

healthy growth in the tree in all respects by feeding it directly and completely.

I began work on our orchard of about forty trees here at Birch Interval Farm at the end of March. These trees are about thirty-five years old and for the last ten years or so at least have been pretty much neglected, except for an occasional pruning. The trees were of several varieties planted in no particular way. I have been told that the former owner "bought a pig in a poke" when he bought these trees so I have not been able to identify all the varieties yet. However, some of all varieties were brought into this experiment. We started this year by giving them all a thorough pruning. I then began to scrape them down, just scraping off the loose bark, and after this I applied the tree paste to each one as it was completed.

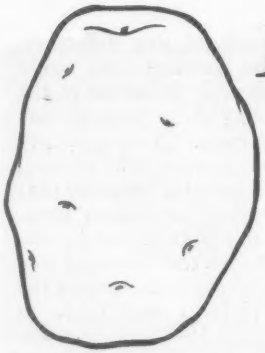
When I had about half of the trees in the orchard scraped and treated with the paste, I was suddenly obliged to stop this work to attend to other matters. This proved to be a very fortunate thing, because it left the other half of the orchard untreated as "controls" against which to check the results of those that were treated. If I had been able to go about it in my usual dogged way, I would have treated every tree and I might never really have known what an effective preparation this tree paste is. There would have been no living "before" and "after" pictures, side by side, such as the photograph of the four branches indicate.

By blossom time, a noticeable difference could already be seen. The treated trees came into blossom a few days earlier and held their blossoms longer than those that were just pruned but not treated. From then on, as the foliage appeared, the difference in favor of those that had received the paste became daily more apparent. Their leaves were quite generally larger, greener and more glossy. The pictures accompanying these notes give some idea of the difference. All the branches shown in the plates are from different trees and are a fair sample of this difference.

Later in the summer one could notice a considerable difference in the more rapid healing of the pruning scars on the treated trees. Quite generally the rate of growth around the pruning scars on treated trees far exceeded that around the scars of untreated trees. Some idea of this growth can be obtained from the picture showing one of the scars on a tree that received the paste. These pictures were taken in early September of 1947—about seven months after the trees had been treated.

During the past season we grew potatoes and husking corn between the rows of the whole orchard in order to break up the old, dense sod and to manure it. In the fall, the trees were all mulched with old hay. (Incidentally, most of this "old hay" came from along the roadside where our local road agent had been trimming. It seems to me that we ought to start a lobby, if there ever was one, in every state where this cutting of roadsides is done to have this material delivered to farms that want it—thus creating true wealth out of what is otherwise an outright waste.) Aside from that noted above these trees received no other treatment or sprays.

The apples themselves did not show quite so remarkable a difference. The consensus here at the farm, however, was that the set of fruit was better on the treated trees than it had ever been before and that in general the fruit from these trees tasted better. Be that as it may, I think it can be fairly said that it is asking a little too much from Nature to expect a great deal of change in such fruit in one year, inasmuch as a tree takes about three years to develop its individual fruits. I believe we can confidently look forward to a considerable change in the next few years certainly, especially as the humus of the orchard soil is increased with mulching and compost. The obviously increased vigor and thriftiness of these trees, resulting from this simple organic treatment, has certainly given these old trees a new lease on life.



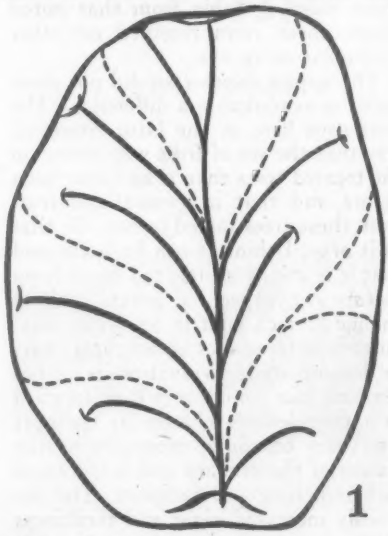
Planting Potatoes

By C. C. WALKER

A potato tuber is a much enlarged and modified stem. The stem end is shown in the upper part of the illustration. The eyes are really buds.

AS a boy, I was much interested in the plant experiments which Dad carried on for his own amusement, in Clinton County, Missouri.

Some of his plant experiments and developments must have been rather successful, for he generally came away from the fairs with several red and blue ribbons. At the time of the World's Fair at St. Louis in 1904 his corn booth which was attended by Uncle Sam, Dad's older brother, attracted much attention. As a result Dad received many letters from corn fanciers in those pre-hybrid days, and I believe he shipped seed corn to about every state in the corn belt without advertising in any publication.



Sketch No. 1. A longitudinal section of a potato tuber showing the fibers (conducting bundles) running from the stem end of the tuber to each eye (bud).

I well recall a conversation which I overheard about twenty-five years ago between Dad and an old potato fancier concerning how potato yields may be increased, and often doubled by the correct method of cutting the tubers before planting.

Later, I questioned Dad, and he showed me what is meant by "feeder fiber" in a potato tuber. Every eye of the potato is fed by veins which run to the stem end of the tuber. That is the way the tuber develops as it grows, and if undisturbed in cutting, the new plant which develops from the sprouting eye will develop and feed through the same feeder bundles (or veins) as it fed as it grew as a tuber. See Sketch No. 1.

Those of us who like to place yams in a vase of water and have the vines as a winter plant, will notice that the sweet potato feeds in much the same way, until after several months growing, the tuber is almost all consumed except the skin. The Irish potato will feed in the same manner if given a chance.

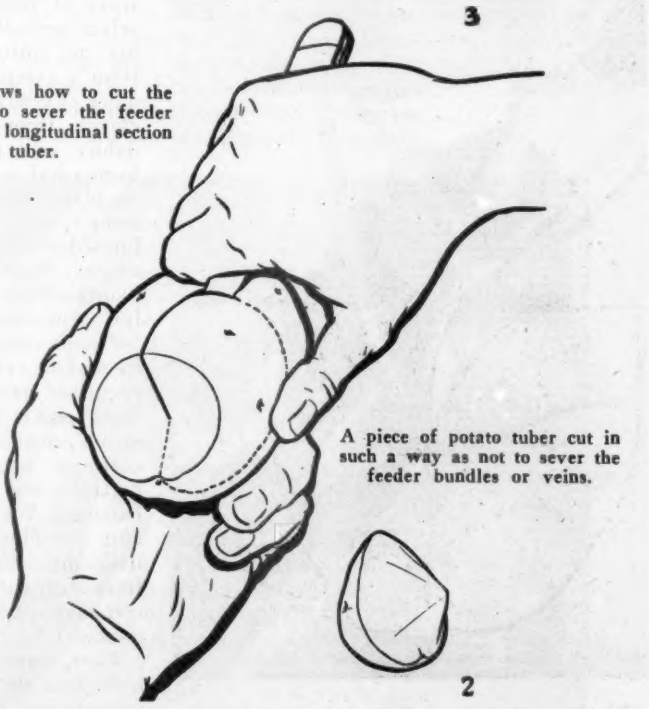
Now, Dad did not believe in idle talk, so he suggested that the following spring I take over a small plot in a fertile section of soil and cut potatoes in four different ways.

In plot Number 1, since the tubers were large, we peeled the potatoes

about ⅛ inch thick, cut the peeling to a single eye, and cooked and ate the inside of the potato. In plot Number 2 we cut the potatoes two eyes to a piece and planted them. Plot Number 3, we planted the smaller potatoes out of the lot, whole. In plot Number 4, we cut the tubers, slicing them beginning about ½ inch above the eye, holding stem end downward, to the stem end, actually meeting the stem with the knife in each cut. In this last plot either one or two healthy appearing eyes were left in each piece, which looked like a sharpened post when we came to the eye end of the potato. We then sliced the eye end through the middle to the stem end. (See drawings 2 and 3.)

The season was dry, but Dad was liberal with his green and stable manures and his land was in fine condition. When harvest time came the different methods we had employed brought us quite different crops. Plot One where the peelings were planted had grown heavier vines than any of the other plots, but the yield was no larger than good sized marbles. Plot Two, the regular 2 eye to the piece system, had a light crop of potatoes, small but suitable for table use. Plot Three where the whole potatoes were planted was a fine yield, despite the drought, of larger than average tubers and the hills were well filled. Plot four also had a fine yield. There were no noticeably different results either in size, quality or yield between the planting of whole potatoes and cutting the potato into five to nine sections, so long as the fiber in the tuber was not destroyed.

I have since repeated the methods used in plots three and four several different years, with similar results. Have finally concluded that for best results, the plant fiber must be preserved both in the land and in the seed.



3

This drawing shows how to cut the tuber so as not to sever the feeder veins shown in the longitudinal section of the tuber.

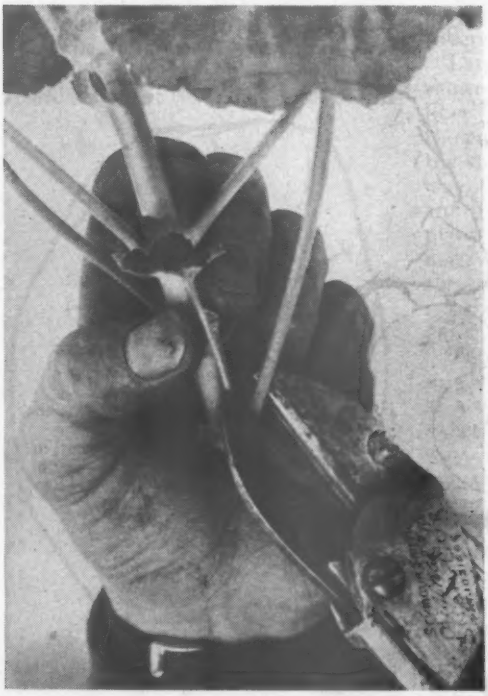
A piece of potato tuber cut in such a way as not to sever the feeder bundles or veins.

2

MULTIPLY YOUR PLANTS BY DIVISION .... *CUTTINGS*

By WILLIAM H. EYSTER, Ph.D.

(A) A cutting should include the five uppermost joints (internodes) of the stem.

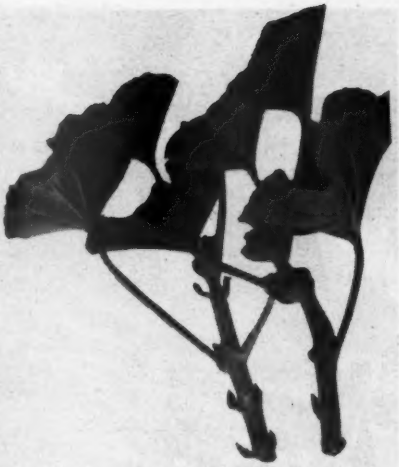


(B) Cut off three leaves from the basal end of the stem leaving the cutting with two leaves.

PRACTICALLY all seed plants, under favorable environmental conditions, reproduce themselves sexually by the development of flowers which ripen into fruits containing the seeds. Many of the same plants have more or less specialized ways of reproducing themselves asexually by developing an entirely new plant from a creeping stem as in quick or crab grass and white clover, from a root as in dahlia and sweet potato, from a leaf as in begonia and air plant (Bryophyllum), or from adventitious buds formed on the stem or root, as in blackberry. Many plants which do not naturally reproduce themselves asexually may be propagated by making *cuttings* of an appropriate part of the plant. Some plants are best reproduced asexually from stem cuttings, some from root cuttings, and some from leaf cuttings. We shall here discuss and illustrate the asexual reproduction of plants from stem cuttings using the common geranium (Pelargonium) for the purpose.

First, however, let us inquire into the advantages of reproducing plants by cuttings of one type or another.

Many plants are cross-pollinated by winds or insects and are hybrid for such characteristics as flower color, plant height, time of flowering, and quality of fruits and seeds so that their offspring grown from their seeds are variable in all these plant characteristics. Plants reproduced asexually from cuttings are all alike and exactly like the parent plant regardless of its hybrid nature. They are true to type. For a flower bed or border, uniformity may be highly desirable. By making cuttings, the gardener can, in a short time, produce many plants from a single parent plant. In this way he will make identical twins, triplets, quadruplets, quintuplets, or multiplets depending upon how many cuttings it is possible to take from the parent plant.



(C) A cutting ready to be put into the sand for rooting.

Any part which can be separated from a plant and grown into a new plant is called a cutting. Cuttings which are made from hard (mature) wood of shrubs and trees are called *hard wood cuttings*. Hard wood cuttings should be made in the fall before freezing weather because low temperatures seem to destroy the root-forming hormones in the twigs. Fall cuttings produce their roots before their tops, which is desirable. Spring cuttings root slowly and sometimes not at all but the tops grow rapidly. It is only after such cuttings develop leaves that they can form roots as the leaves produce the root-forming hormones which then pass down to the base of the cutting and stimulate the formation

(D) Place lower end of cutting in sand so that two nodes are below the surface.

(E) Tamp the sand between the rows with a piece of board and hammer to drive out air and compact the sand about each cutting.

of the roots. Many trees and shrubs can be propagated by taking soft (immature) wood cuttings in summer, others do better if half-hard wood is used.

For cuttings, use sections of stems including five buds. Beginning at the tip count back to the fifth bud and cut the stem about a half inch below the fifth bud, as shown in Plate A. Trim off the basal leaves as indicated in Plate B so that the cuttings have only two or three leaves at the top as shown in Plate C. The leaves nourish the cuttings and produce a hormone which descends to the base of the cuttings and stimulates the development of roots. As the cuttings are made the lower ends of the stems may be allowed to dry out some but the leaves should be protected from water loss. The cuttings should then be "planted" in sand as shown in Plates D and E. After the flat is filled with cuttings, tamp the sand to eliminate all air pockets. This can be done by cutting a piece of board approximately as large as the space between two adjacent rows. Lay the board on the sand

(F) Rooted cuttings ready to be transplanted into soil.

(G) Transplant cuttings in pots containing soil with plenty of compost. To force profuse blooms, use small pots so that the plants become pot-bound.

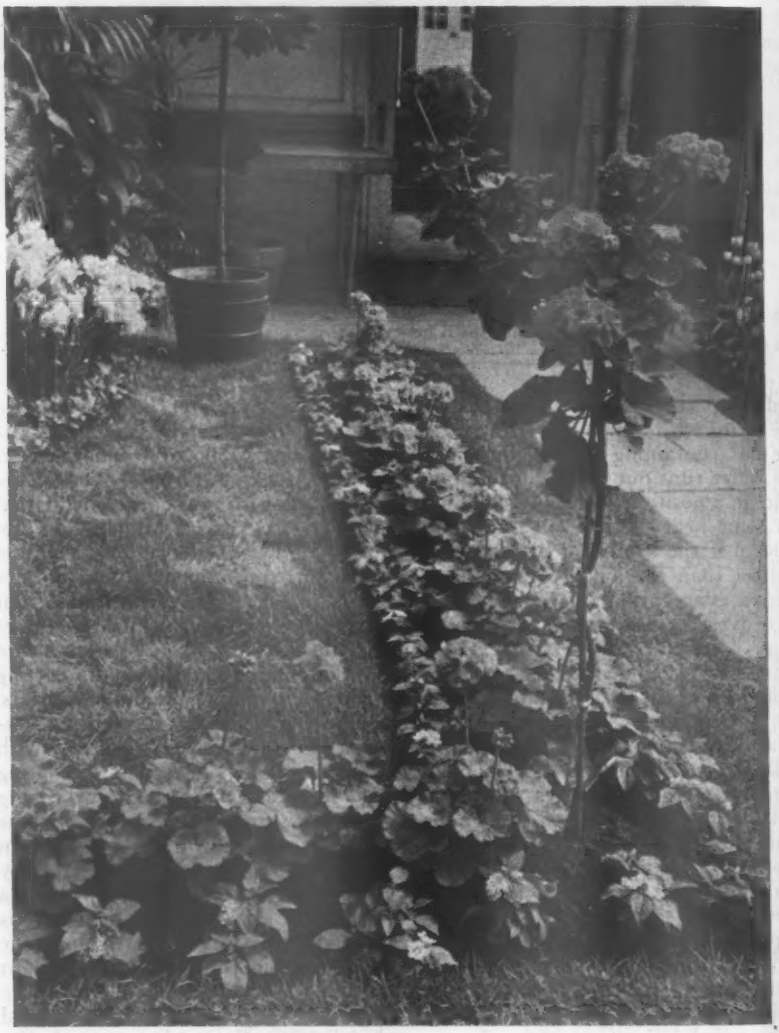
and tamp the sand down by striking the board with a hammer. Now water the flat containing the cuttings until the water runs out of the bottom, and place in a position where the sand may get some heat. Roots will form more quickly if the sand is kept somewhat warmer than the air. To prevent excessive evaporation, place a piece of glass over the flat containing the cuttings.

Sand is recommended as a cutting medium because it is cheap, easy to get, and is relatively sterile. Also it holds just enough water and admits sufficient oxygen for the development of roots. Other substances which can be used are finely chopped sphagnum, peat, and vermiculite. Vermiculite is a mica product made up of tiny particles containing many thin layers between which much moisture is entrapped.

When cuttings of dicotyledonous plants are placed in sand or other medium for rooting, a layer of spongy tissue called *callus* forms over the cut surface of the stem. Conditions which form callus formation also favor rooting. The callus first serves as a wound protection and later become absorptive and meristematic and gives rise to the roots. Monocotyledonous plants as lilies, asparagus, irises, grasses, and aroids, root in an entirely different manner. As a rule calluses do not form, but the cut surface becomes corky in appearance. Roots do not grow from the base of the stem, but from one of the buds which then gives rise to the new plant. As this bud develops into a new plant the cutting withers and finally dies and disappears.

The time required for rooting cuttings varies with conditions and with different plants. The time for rooting can be greatly shortened by keeping the sand warm. The cuttings of some species of plants will develop roots in three weeks or less, while others may require several months. When a strong root system has been formed, as illustrated in Plate F, remove the cuttings from the sand with a plant dibble in such a way as not to injure the roots. The rooted cuttings should then be transplanted in pots or in the soil in exactly the same way as seedlings are transplanted, as illustrated in Plate G.

A border of geraniums produced from cuttings is shown in Plate H. In such a border, uniformity is extremely important. If the plants of the border originate from the same parent plant they will be exactly alike as to height, size and color of leaves, time of flowering, and color of flowers. Uniformity is the most important characteristic of an effective border or bed. Older plants can be pruned and trained to grow up like a shrub providing the stem is given sufficient support in the form of a stake or trellis.



(H) Geraniums (Pelargoniums) can be used as a border, or can be trained to grow as a staked tree as shown in the corner of the border. Edge the geranium border with coleus.

The Soil and Health Foundation

THE SOIL AND HEALTH FOUNDATION was incorporated in the Courts of Lehigh County, State of Pennsylvania, in September, 1947. In October, 1947 the board of directors and other officers of the Foundation were elected. Since then, the Foundation has been receiving contributions and beginning, in a small way, researches of a fundamental nature, and concerned with the carrying out of the purposes for which the Foundation was organized. These are, stated briefly, 1) to investigate all aspects of soils in relation to the foods and health of man, 2) to determine to what extent artificial chemical fertilizers lead to the deterioration of the soils and health, and 3) to recommend measures that will lead to the reclamation of substandard soils and to prevent deficiency diseases in man by providing him with complete foods.

Already an experiment is in progress in the laboratories of Dr. Ehrenfried Pfeiffer which is concerned with the possible relation between deficient food plants and the incidence of cancer in mammals. By an ingenious use of crystal patterns, Dr. Pfeiffer is able to detect the various deficiency or degenerative diseases in an early stage so that effective preventative measures may be taken. The results of these studies will be published in the official bulletin of the Foundation from time to time. Dr. Pfeiffer is well qualified for such researches into the causes and nature of cancer.

Preliminary experiments are in progress which are concerned with the effects of artificial chemical fertilizers and poisonous sprays and dusts on the organisms of the soil. It has been found that ammonium sulphate, when applied in the amounts recommended for use as an artificial fertilizer in the soil, is highly toxic to earthworms so that within a relatively short time it proves fatal. The nitrogen-free artificials are also toxic but to a lesser degree than those which contain nitrogen. Earthworms in soils treated with the various chemical fertilizers used seem to have a desire to escape. To prevent this, fine wire screening has been used. The Foundation is devoting its early attention to the earthworm because of its fundamental importance as a soil conditioner. It is nature's digger which improves both the physical and chemical nature of the soil.

The first bulletin is now in preparation and should be ready for distribution to members of the Foundation sometime in April. Anyone wishing to become an associate member and in this way have a part in carrying out the purposes of the Foundation need only send to the Secretary a contribution to be used in supporting the researches. Contributions may be large or small, according to the circumstances of each individual contributor. We feel that fertile soil and good human health appeal to all, whether rich or poor. Without these values, wealth means very little.

The Foundation is looking forward to the study of such organic poisons as DDT, 2-4D in relation to the Earth's Green Carpet, to the balance of animal life, and to the health of man. It is our hope that funds may become available soon for researches in the application of this and similar laboratory findings on agriculture as a whole.

Interested persons may become associate members of the SOIL AND HEALTH FOUNDATION by sending their contributions to the Secretary, 46 South West Street, Allentown, Pennsylvania.

THE SECRETARY

THE FIG TREE GOES UNDERGROUND ..... *for the Winter*

By DR. WILLIAM H. EYSTER

THE fig tree has been in cultivation since ancient times and has been moved from its native hills in India to many parts of the world. Many varieties were known and described by Theophrastus, the Father of Botany, whose descriptions of the fig tree, the fruit, and of caprification (pollination) are full and complete. The common fig, *Ficus carica,* is a shrub or small tree, never epiphytic (growing on other plants) or parasitic, which when mature is from 20 to 25 feet high. The short trunk bears an unusually large round head. The leaves are thick and leathery, and often are of many irregular shapes much like the leaves of sassafras and mulberry; the light green leaves have prominent veins. (Fig 1). The numerous flowers are borne on the inner wall of a hollow flask-shaped receptacle. Fruits of the common fig develop without caprification. The Smyrna figs, however, do not. Flowers of these figs must be pollinated by pollen from the male flowers of caprifigs, whence the name caprification. The ancients knew that it was necessary to tie or to append caprifigs to trees of Smyrna figs to induce fruit setting, but they did not know why except that it was a part of a ritual that made the fig tree fruitful. We now know that what they actually did was to insure pollination of the female flowers of the Smyrna fig tree with pollen from the male flowers of the caprifigs. Pollination is effected in nature by the fig wasp.

Figure 1
A fig tree growing in Allentown, Pa.

Figs are now being grown successfully in many tropical and semi-tropical countries. In the Mediterranean region where it has long been established, fig culture has become an important permanent industry. In the Americas it is grown on the Pacific coast from

Oregon to Chile. It has been cultivated in the southeastern Atlantic and Gulf States since early colonial days. In California it may soon vie with citrus growing in commercial importance.

In general the fig tree thrives best in warm climates. It recovers quickly from frost and storm damage. The trees become hardier as they become older. It can even be grown in the temperate zones where the winters are cold and severe by going underground for the winter. Mr. Philip Malone, Allentown, Pa. has had a fig tree in his yard for years. As soon as the leaves drop from the tree in the fall, a rectangular excavation large enough to receive the top of the tree is made and the tree is laid over in horizontal position and completely covered with boards over which is placed a protective layer of ground, as shown in Fig. 3. The tree stays underground until all danger of freezing is past in March or April. Then the ground and boards are removed, and the tree is brought back into its normal vertical position. The ground is filled in the hole and the tree is ready for another growing season and two crops of fruit. The tree blooms almost immediately after its resurrection in the spring and then again some two weeks later so that two crops of fruits are produced each season. Mr. Malone's tree, which is about 10 feet tall, bore over two bushels of figs in 1947. Although the fig tree has been in cultivation since ancient times it is only recently that it has been successfully grown in regions where the summers are warm but the winters are cold. It can survive cold winters only by going underground.

Figure 2
Home-grown figs are delicious.

Figure 3
The tree shown in Figure 1 underground for the winter.

BOTANY
for the Organic Gardener (6)

By DR. WILLIAM H. EYSTER

The Soil In Relation To Plants

THE soil is the natural environment of the roots of higher plants and of many non-green plants (bacteria, thread bacteria, and fungi) which live entirely within the soil. It effects the form, distribution, and activities of all plants so much that an elementary knowledge of the soil is essential for an understanding of the nutrition of plants. The soil is much more complex chemically, physically, and biologically than is the atmosphere in which the aerial parts of the higher plants grow.

Although soils vary a great deal in origin, in physical texture, in chemical composition, in depth, in fertility, and in many other respects, all soils consist of rock particles, humus, water, air, dissolved chemical compounds or solutes, and soil organisms. The percentage composition of an average soil is shown in the pie diagram in Fig. 15. The soil is in reality a large physicochemical laboratory in which many reactions of vital importance to all forms of life are taking place. The chemical elements which are bound up in the bodies of dead plants and animals as well as all residues which are shed from living plants and animals are being constantly released by countless billions of organisms which live entirely within the soil. So also chemical elements which are bound up in inorganic compounds are being changed into water-soluble salts which thus become available to green plants. The soil is indeed a great storehouse of nutrient materials for all plants.

The soil serves higher plants in a number of distinct ways: 1) It provides an anchorage for the plant so that the aerial parts may be held in position most favorable for the carrying on of their special life processes. 2) It acts as a vast storehouse of water and nutrient materials which are essential to the life of the green plant. 3) It protects, during seasons unfavorable for growth, roots and underground

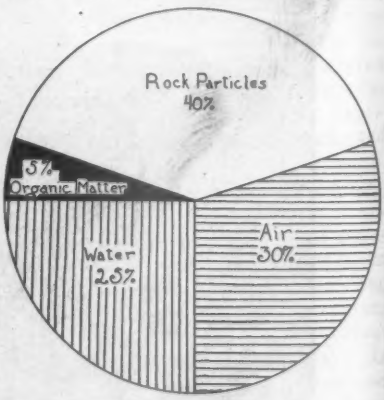


Figure 15.

stems which often contain vast stores of reserve plant foods to be utilized by plants for the resumption of growth when favorable growth conditions return. 4) It serves the abode of the countless billions of soil organisms.

Texture of the Soil. The soil is composed of weathered rock particles of various kinds, water containing a variety of dissolved substances, air, organic matter, and living organisms. Soils are classified and named according to the sizes and kinds of the rock particles which they contain as *gravel, sand, silt,* and *clay.* A soil having a large proportion of sand is called a sandy soil, one having much clay is called a clay soil, while soils which contain both sand and clay are called *loams.* Soil particles vary in size from less than 0.0002 inch in clay to about 0.04 inch in diameter in gravel, and differ in shape and chemical composition according to the kind of rocks from which they originated. Because of their irregular shapes the soil particles are more or less loosely arranged so as to leave interspaces of different sizes which are occupied by air and soil water. The physical nature of an ordinary soil is indicated diagrammatically in Fig. 16. Soil particles ordinarily cohere, due to the water films which surround them and cement materials, to form *soil crumbs* or *floccules.*

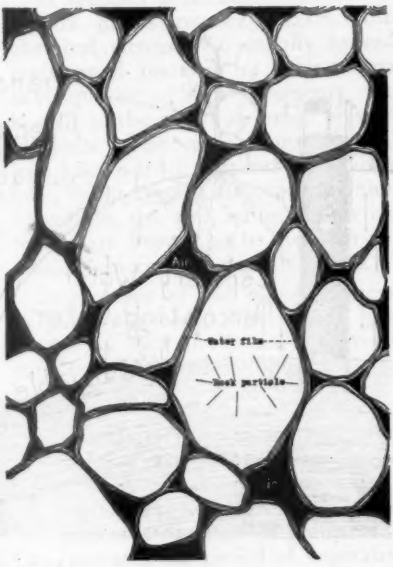


Figure 16.

Water in the Soil. Water is of the most vital importance to all organisms, and its uses may be summarized briefly as follows: 1) Water is the solvent which makes possible the entrance of any substance into the plant body, as only substances dissolved in water can be absorbed. 2) Water serves as a medium of transportation of plant nutrients and plant foods through the plant body. 3) Water is the medium in which all life processes are carried on. 4) Water is a fundamental constitutent of all living protoplasm. 5) Water is an essential raw material in the building up of carbon compounds by photosynthesis in green plants. 6) Water is necessary for maintaining the normal turgidity (internal pressure) of living cells. Cell turgidity plays an important part in maintaining the normal position of plant bodies, and is a necessary condition of the cell for carrying on its life processes. When the cells of a plant lose some of their turgidity the leaves and young parts of the stem droop and the plant is said to have wilted. 7) Water is the medium through which the microscopically small soil organisms move from place to place.

The most important natural source of soil water is that which precipitates out of the atmosphere and falls upon the surface of the soil in the form of rain, snow, and dew. The amount of water thus furnished which actually enters the soil depends upon such conditions as the nature of the soil, kinds and amounts of vegetation on the surface, the rate of precipitation, the slope, the organic matter in the soil, the existing water content of the soil, the physical condition of the soil, and the season of the year. Water, like all other constituent parts of a living organism, passes through a cycle as illustrated in Fig. 17. The water cycle of a

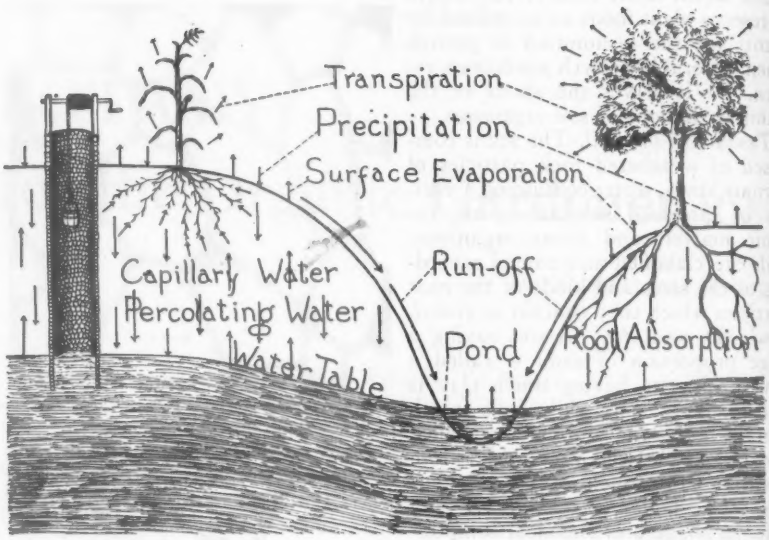


Figure 17.

green plant includes vapor in the atmosphere, water of precipitation, soil solution, cell sap or a constituent of protoplasm, and then back into the air again as vapor. The water which enters the soil tends to occupy the spaces between the soil particles and to extend around the soil particles in the form of films. Under the influence of gravity, the water in the soil particle interspaces percolates downward, rapidly in gravely and sandy soils and more slowly in soils composed of smaller rock particles, until it reaches the level where the soil is saturated with water. This level is called the *water table.* The water table is approximately parallel to the surface of the soil, varies widely in depth below the surface from place to place, and is subject to much fluctuation.

The water which sinks to the water table is often beyond the reach of the roots of plants. Much of the water which enters the soil, however, will not sink to the water table but will remain in the upper layers of the soil as thin films around the soil particles and in the pores of humus. Fine soils have a greater water-holding capacity than coarse soils due to the greater total surface areas of the smaller particles of the fine soils. It is the water that is thus held in the upper soil layers that is available to plants and soil organisms. The presence of organic matter in the soil increases its water-holding capacity because the particles of organic matter not only are surrounded by the usual films but also admit water into their interiors.

The water films about adjacent soil particles coalesce to form a continuous film-system in the soil. If water is removed from any part of the soil by evaporation into the atmosphere or by absorption by plants, the water films around the soil particles become thinner. Immediately water will move from adjacent soil particles where the films are thicker so as to restore the equilibrium of the film-system. Thus, loss of water from the surface layers of the soil generally causes an upward movement of water from the deeper soil regions, and may extend to the water table and cause it to be lowered.

The film-system in the soil draws water from the water table to the surface layers of the soil much like the wick of a kerosene lamp transmits oil from the lamp to the flame.

The rise of water in the soil is dependent upon capillarity. The intercommunicating air spaces of the soil act upon water as capillary tubes. Not all of the water which is held in the soil can be used by plants. As water is removed from the soil, the films around the soil particles become thinner and thinner, and finally the attraction between the extremely fine water film and soil particle is so great that plants cannot get the last traces of water.

Available Minerals in the Soil. The water in the soil is commonly called the *soil solution* because it has dissolved in it many chemical compounds. Only substances which are dissolved in water can usually be absorbed by plants and are thus available to them as nutrient materials. The dissolving power of soil water is increased by the presence in it of carbon dioxide which is given off in the respiration of plant roots and of the innumerable plants and animals which live entirely within the soil. The nutrient materials dissolved in the soil solution, some more readily than others, may enter the plant body through the root or other part of the plant body that is in contact with the soil. It has been found that approximately thirty four chemical elements are of greater or lesser importance in the nutrition of plants. The elements which are used in larger amounts and thus often called the major elements include carbon (C), hydrogen (H), oxygen (O), phosphorus (P), potassium (K), nitrogen (N), sulphur (S), calcium (Ca), iron (Fe), and magnesium (Mg). These elements can easily be remembered by writing the symbols in the form of a cafe advertisement, as follows: C. HOPKNS Cafe, Mg. These elements are necessary for the growth and reproduction of all plants and are therefore usually referred to as the *essential elements* in plant nutrition.

In addition to the essential elements certain plants require certain other chemical elements in usually exceedingly small amounts for their normal development. Such elements are known as the *minor elements* or *trace elements*. The more important and best known trace elements are manganese, boron, copper, zinc, molybdenum, vanadium, tin, and iodine. Other elements are known to be necessary in minute amounts in various plants.

Importance of the major elements in plant nutrition. The general part played by each of the major elements can be summarized as follows:

Nitrogen:

1. Stimulates the vegetative growth and a greener color in higher plants.
2. Increases protein content in grains.
3. Increases hardness in grains.
4. Increases the period of vegetative growth.
5. Tends to increase fruitfulness.
6. A deficiency causes stunted growth and yellow leaves.
7. Excess delays flowering, causes abnormal growth in length and lodging in grains, increases susceptibility to disease, and reduces the quality of the fruit.

Phosphorus:

1. Stimulates root growth.
2. Increases resistance to winterkill and diseases.
3. Hastens maturity.
4. Increases seed production.
5. Reduces lodging in grains.
6. Increases palatability of forage to stock.
7. A deficiency causes purplish colored leaves, stunted growth, and a poor yield of seeds which tend to be sterile.

Potassium:

1. Is essential for the division of cells in growth.
2. Acts as a stabilizer of excess calcium or nitrogen.
3. Aids in the utilization of nitrogen.
4. Decreases the water requirements of plants.

5. Increases the resistance of plants to diseases.
6. Stimulates the production of starches, sugars, and oils.
7. Reduces winterkill of plants.
8. Improves the keeping quality of fruits.
9. Reduces the boron requirements.
10. Promotes color in fruits.
11. A deficiency causes firing of leaves, poor set of seeds including many that are poorly developed and sterile.

Calcium:

1. Necessary for root development.
2. Corrects acidity in the soil and within the plant.
3. Encourages bacterial activity.
4. Improves the tilth of the soil.
5. Aids in the utilization of potash, boron, and magnesium.
6. Favors the development of legume nodules.
7. Aids in the translocation of foods in plants.
8. Favors the differentiation of plant tissues and makes them stocky.
9. A deficiency causes yellow top, terminal buds to die, cracked stems, and poor root systems.
10. An excess makes unavailable in the soil many other essential elements.

Magnesium:

1. An essential part of chlorophyll.
2. Essential for the utilization of nitrogen, phosphorus, and sulphur.
3. Aids in the formation of proteins.
4. Helps to correct the acidity in soils and in plants.
5. A deficiency causes the lower leaves to turn yellow between the veins, beginning at the leaf edges. The leaf then changes to orange and later brown as it dies.

Sulphur:

1. In the form of sulphates essential to all plants.
2. Essential in the formation of chlorophyll.
3. Increases the formation of proteins, especially in legumes.
4. Deficiency causes yellowing of upper leaves similar to that caused by a deficiency of nitrogen.

Iron:

1. Acts as a catalyst in the formation of chlorophyll.
2. Influences the color of flowers in some plants.
3. Intimately related to the formation of carbohydrates.
4. A deficiency similar to that of nitrogen and sulphur, and is common in alkali soils.

Carbon, hydrogen, and *oxygen* are available to the plant in such compounds as carbon dioxide in the air, water in the soil, and less commonly as other compounds. These elements are built up into simple sugars and starches which are fundamental to the synthesis of all other plant parts.

Minor Elements:

1. The minor elements are essential in much smaller amounts than the major elements.
2. Some minor elements are important in the nutrition in some plants, others in other plants.
3. Minor elements often work in pairs, as boron and zinc for rosette in fruit trees.
4. Some increase the plant's resistance to diseases.
5. Some appear to function as enzymes or co-enzymes.
6. Some have a stimulating effect on the bacterial activity in the soil.
7. Most are extremely toxic to plants if used in excess.
8. Some make up for the deficiency of other essential elements.

Definition of Terms

Carbohydrate—an organic compound made up of carbon, hydrogen, and oxygen with the hydrogen and oxygen in the ratio of 2:1, as $C_6H_{12}O_6$.

Catalyst—a substance which starts or assists the chemical action between two or more other substances without itself combining

with either of them or undergoing any permanent change.

Chlorophyll—the green pigment in the plant which enables it to synthetize carbohydrates from water and carbon dioxide using light as a source of energy.

Co-enzyme—is an organic fraction of an enzyme which passes through an animal membrane.

Enzyme—is an organic catalyst produced by a living organism.

Legume nodules—tumors on the roots of leguminous plants caused by bacteria which can take nitrogen from the air and deliver it to the plant.

Microscopically small—so small that it can be seen only with the aid of a microscope.

Nutrient materials—chemical compounds in the soil which are used as raw materials by plants. These materials are built up into complex organic substances by plants.

Photosynthesis—is the process, unique to green plants, which consists in the building up of carbohydrates from water and carbon dioxide using light as a source of energy. It is the most fundamental chemical process on the planet.

Physico-chemical laboratory—is a laboratory in which physical and chemical changes are involved.

Protoplasm—is the living matter of which all plants and animals are composed.

Salts—are compounds formed by the replacement of the hydrogen of an acid by a base. When sodium (Na) replaces hydrogen (H) in hydrochloric acid (HCl), ordinary table salt (NaCl) is formed.

Translocation of foods means the movement of foods from one part of the plant body to another.

Toxic means poisonous to organisms.

Turgidity refers to the internal pressure of a living cell. Living cells in plants are inflated with cell sap much as a basket ball is inflated with air.

Water table refers to the level in the soil below which the soil is saturated with water.

EDITOR'S NOTE:—The next article in "Botany for the Organic Gardener" will be concerned with the plants that live entirely within the soil.

Registration of Organic Gardening Clubs

If you have not already done so, register your Organic Gardening Club with the Managing Editor by sending in the name of the club, names of the officers of the club, place and date of club meetings, activities of club, names of members of your club who can give lectures to other clubs, and indicate ways in which the Magazine can be of help to your club. We want to be of service to your club.

Garden Calendar—April

THE NORTH AND EAST

April is the time for great activity in the gardens of the North . It is the time for the resurrection of the perennials which have withdrawn to the soil for the winter. The seeds of annuals which have lain dormant in the soil during the winter respond to the warmth of the sun by germinating and growing into new plants. Our first attention is quite naturally directed to the soil. Winter mulches should be removed gradually and carefully from perennial beds and borders. The finer parts of the mulch should be left on the soil to serve as food for the soil organisms.

Compost the soil heavily as part of its preparation for planting. Dig as little as possible, and do not work in the soil when it is too wet. Cover your seeds with compost that has been put through a fine screen.

Flower Garden:—Give the perennials a good top dressing of compost. This procedure will enrich the soil and discourage the growth of weeds. Do not disturb the soil about the plants. Divide and replant such perennials as delphiniums, heleniums, anemone, japonica, fall asters, ceratostigma, shasta daisy, azaleamums, and chrysanthemums. The new plants grown from parts of old chrysanthemums and azaleamums will grow more vigorously and bloom more profusely than the old plants. Phlox and Michaelmas daisy should be divided, but only the outer ring should be used for propagating new plants.

As soon as the weather is settled, set out from coldframes pansies, forget-me-nots, Canterbury bells, aquilegias, foxgloves, and others. Such rampant growing perennials as achillea, goldenglow, boltonia, Japanese lanterns, and sedum should be weeded out to make room for new growth. You cannot possibly eliminate these plants regardless of how closely you seem to be pulling out the old plants. Remove the winter mulch from the spring-flowering bulbs before they develop leggy stems.

Gladiolus plantings may be begun late in April and repeated at two week intervals until well into the summer for continuous blooms. Give the irises side dressings of compost. Plant seeds of the annual hollyhocks now for August blooms. Petunias may be sown outdoors if the soil has been well raked and heavily enriched with compost. It may be well to cover the seed bed with burlap to prevent the seeds from being washed out by spring rains. Do not forget to remove the burlap just as soon as the seeds have germinated. House-grown seedlings of annuals should be exposed to the outdoors air each day to harden. Pinch back any plants which seem to have weak, leggy stems. This is the last call for planting sweet peas which should have been planted in March.

This month also is the best time to plant the golden-banded lily of Japan, the regal lily, the speciosum lily, the Formosa lily, Henry's lily, and other lilies of this general class.

Early irises may be dug up and removed inside for early blooms indoors. Cuttings of house plants as wandering jew, coleuses and others should be made for setting out in the garden later. There is still time to start dwarf dahlias, but the seeds should be sown indoors or in the coldframes.

Perennial phlox, if pinched back when young, will give a long succession of flowers. Oriental poppies die down rather early and leave an ugly open space in the border. Such spaces can be closed by planting scarlet sage or hyacinthus.

The Lawn:—The lawn should be given a good coating of finely screened compost. Rake the bare spots with an iron garden rake and seed them. By feeding the lawn now so that the lawn grass makes a rapid growth, you will not be bothered with quack grass later. The quack grass spends the winter in the seed stage, and it will not be able to establish itself if the ground is well covered with lawn grass. Fill low spots with good soil. The lawn grass will come up through the new soil if not thicker than a half inch to an inch. Bone meal may be added to the compost for the lawn.

Vegetable Garden:—Time to plant horseradish, spinach, kohlrabi, onion seed, early cabbage, early celery, herbs, lettuce, parsnips, parsley, early peas, early potatoes, radishes, endive, Swiss chard, turnips, asparagus, beets, broccoli, Brussels sprouts, and other plants having similar growing requirements. Late in April, sow pole beans. To get an earlier than usual start of the more tender vegetables get a supply of hot caps to place over the individual plants until the danger of frost is past.

THE WEST

Flower Garden:—As soon as you see volunteer plants of any kind in the garden, you may be sure that it is safe to plant the seeds of such plants. If you see a volunteer marigold, for example, it is safe to set out in the border or bed marigold seedlings that you may have started indoors. Self sown seedlings are apt to be strong and are valuable plants providing you are sure of the variety to which they belong.

Set out chrysanthemums now. Sprout dahlia roots before putting them in the soil, or you can sprout them and transfer the rooted shoots to the garden. In this way many plants may be obtained from a single root. Transplant into the garden zinnias, marigolds, asters, petunias, and other half-hardy plants. Keep the gladioluses well watered and make repeated plantings for continuous bloom during the summer and fall. Transplant Transvaal daisies. Plants which do not like to be transplanted are nasturtium, portulaca, salpiglossis, mignonette, and California poppy.

Summer bulbs should be planted late in April. In the Pacific northwest, April is the month for snowdrops, scillas, crocuses, winter aconites, puschkinias, and chionodoxas. Set out pyrethrums. Make cuttings of pentstemon, and separate the pampasgrass.

Vegetable Garden:—See suggestions made for the North and East. Vegetables are ultra-hardy, hardy, semi-hardy, semi-tender, tender, and very tender. In planting vegetables, refer to Nature's planting schedule in this issue.

THE SOUTH

Flower Garden:—Prune spring-flowering shrubs and climbing roses which bloom only once a year immediately after they have finished blooming. Divide and reset the chrysanthemums.

Seeds that may still be sown are sweet alyssum, four o'clock, moonflower, periwinkle, portulaca, sunflower, ageratum, marigold, torenia, petunia, cosmos, zinnia, and balsam.

Any plants that you may have can be set out into the garden. Some that can best stand heat are gaillardia, zinnia, portulaca, ageratum, physostegia, and wishbone flower. For tropical backgrounds, plant in moist shady places bananas, elephants-ear, castor bean, cannas, caladium, acalypha, coleus, gingerlily, and ricepaper plant. For dry sunny places use bamboo, yucca, agave, Chinese hibiscus, lantana, cestrum, clerodendron, and the pampas and other grasses. The iceplant is recommended as a ground cover.

NEW FRONTIERS
for the Share Cropper

By WILLIAM T. CRISP

"WE looked for the sorriest land we could find." Thus spoke novelist James Street, contemporary author of no small renown, when asked about his crusade to demonstrate that the soils of the South can be reclaimed and its people made prosperous. It was a stimulating experience to find an influential person who seems to appreciate the intimate relationship between soil and men. Mr. Street sought, and believes that he found, the most run-down piece of farm land in the State of North Carolina. This demonstration farm, which has been named Lystra Farm is located in the Carolina Piedmont about seven miles south of Chapel Hill. On this farm, abandoned a number of years ago, Mr. Street has set out to find ways and means whereby the soils of the South can be made productive and to show the Negro needs only an opportunity to become a prosperous and responsible citizen. Lystra Farm is tenanted by Eddie Blackwell, a Negro who seems to be as enthusiastic in reclaiming the soil as is Mr. Street.

When purchased in 1945 the soil of Lystra Farm, according to Mr. Street,

A general view of Lystra Farm where new frontiers for the share cropper are being established.

"was as hard as our flagstone terrace." But that was two years ago. When the writer visited this farm in the late summer of 1947, it was apparent that a transformation had already taken place. Spacious rolling fields, green with various legumes and grasses; freshly painted farm buildings; trimly pruned and neatly supported grape vines; and a newly repaired farmhouse —all these impress the visitor with Mr. Street's planning, and are evidences of the neatness and thoroughness of Eddie Blackwell, the tenant. Beyond the barnyard proper, one hears the occasional grunting and squealing of Hampshire hogs—the profit crop of novelist and Negro, partners in one of the most significant farm operations in this country. And certainly not to go without mention is the key to Lystra Farm's development—the stone and concrete compost pit, 60 feet long, 12 feet wide, and 5 feet deep, lying just behind the barn.

For many decades Lystra Farm has known nothing but the yearly habit of being plowed under, doused with chemical fertilizers, and planted in corn or tobacco. Under Mr. Street's planning, this procedure has been almost completely changed.

Lystra Farm contains 119 acres, ninety of which have been completely recleared and are being reclaimed by Mr. Street, his two sons, Jimmy and Jack, and Eddie Blackwell. Fifty acres of the farm have been designated as pasture land for the Hampshire hogs and five Jersey cows. This pasturage is at present sown with both White Dutch and Ladino clovers. By August, 1948 these legumes will be supplemented by such other legumes and grasses as Lespedeza, Alsike Clover, Perennial Rye Grass, Orchard Grass, Herds Grass, Dallis Grass, and Kentucky number 31 Meadow Fescue. Mr. Street believes that by sowing such grasses he can eventually provide his livestock with a pasturage which will afford year-around grazing, something rarely accomplished in this region.

The remaining 40 acres of recleared land have been divided into Fields 1, 2, and 3, and are being cultivated according to a plan by which one of the fields completes a rotation cycle every year. The rotational plan runs as follows: a field is sown in Lespedeza for two consecutive summers, after which, during the fall of the second year, Crimson Clover is sown. The following spring a layer of compost

A compost enclosure made of native stone on Lystra Farm.

about two inches thick is spread over the field which is then planted with corn and Crotolaria. When the corn is harvested in the fall, the Crotolaria is turned under and the field is sown with winter peas. This completes the cycle in the rotation of crops. The corn crop serves a double purpose in that it provides feed for the Hampshire hogs as well as green matter to be shredded and converted into compost. Mr. Street believes that the only difficulty in maintaining a compost pit in the South is the comparative lack of green matter to be had for that purpose in this region. This difficulty, however, can be overcome by growing leguminous plants especially for this purpose.

When asked how and why he had become so enthusiastic about organic gardening, Mr. Street told a curious story. In writing his books* he often found it necessary to treat with various questions of agricultural significance. He continually referred to textbooks for his information on such questions because, as he stated, "I am not a farmer." His readers, however, evidently received a contrary impression for they began writing him letters of inquiry with regard to many different farm problems. When he left New York a few years ago, Mr. Street's understanding friend, H. Allen Smith, a prominent writer, gave him a book which contained hundreds of questions and answers concerning farming. But this was not how he became interested in the work he is doing today. One day after he had come to North Carolina, Mr. Street noticed, in a publication, the name of which he can't recall, a reference to *Organic Gardening Magazine*. He immediately became interested, he says, because he was at odds to understand what the term "organic gardening" meant. He thereupon subscribed to the magazine and has taken it ever since. Due largely to the magazine's insistence that chemical farming is a great factor in soil deterioration, Lystra Farm's development under a system of compost rejuvenation has resulted.

Mr. Street hopes that within a short time Lystra Farm will be producing 80 Hampshire hogs per year. This, however, is not the only profit aspect of the farm's future. Noting the increase in cattle farming in this region, Mr. Street plans eventually to start a beef herd. And, believing that many of the grapes which are annually shipped to Carolina wineries from the West can be grown here in the South, Mr. Street also has an eye towards a large vineyard.

**Look Away, Oh Promised Land, In My Father's House, The Biscuit Eater, Taproots, By Valous and Arms,* and *The Gauntlet.*

Kodachrome Slide Library

READERS OF THE ORGANIC GARDENING Magazine are invited to help build a Kodachrome (colored) Slide Library concerned with all aspects of Organic Gardening and Organic Farming. We are especially interested in stages in the construction of a compost heap, views of organic farms and gardens, vegetables, fruits, seeds. We will pay $1.00 for each slide that we accept for the Organic Gardening Library. We hope that many of our readers will cooperate with us in this library.

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by His Friends.

With the death of Sir Albert Howard, his quarterly *Soil and Health* is ceasing publication, by his own wish, and the work will be carried on by Newman Turner in *The Farmer.* Lady Howard has intimated this to all who are interested in the work of the great organic movement initiated by her late husband.

A cordial invitation is extended to all Sir Albert Howard's readers, contributors and correspondents, to maintain contact, exchange information and follow the progress of the pioneers through *The Farmer.*

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These books may be obtained through your bookstore. Sorry, we cannot purchase them for you.

THE AFRICAN VIOLET—SAINTPAULIA by Helen Van Pelt Wilson (M. Barrows and Company, Inc., Publishers, New York, New York, 1948. $2.50).

It is a pleasure to review for our readers this beautifully illustrated book on the classification and culture of the African Violet, the universal favorite of the window-garden plants. This book includes 11 chapters with 26 drawings, 68 detailed descriptions of varieties, and 175 listings. It includes all the answers to questions concerning the requirements on the part of African Violet plants for satisfactory growth and continuous blooms.

DWARF FRUIT TREES by Lawrence Southwick (The Macmillan Company, New York, New York, 1948. $2.50).

How about having a fruit orchard in your back yard? Read Mr. Southwick's book on dwarf fruit trees. Real dwarfs, as described in this book, are the results of many decades of experiment and research. You can grow nearly a dozen dwarf fruit trees in the space usually occupied by one large apple tree. The author covers all aspects of these interesting back yard orchard trees.

THE BUSINESS OF FARMING by Herrell DeGraff and Ladd Haystead (University of Oklahoma Press, Norman, Oklahoma, 1948. $3.00).

Here is a real textbook on farming. In discussing soil management, the authors make it clear that the soil will either make or break you. The most important aspect of the soil is its humus originating from crop residues. In discussing compost in relation to the soil the authors quote from Mr. Rodale's *Pay Dirt* as follows, "Again, the theory has not been adapted to commercial agriculture on a wide scale, although very recently a book entitled *Pay Dirt* has attracted much attention and may bring in its wake wide experimentation and possibly an eventual significant acceptance." A good farm manager will never stop studying his soils and will maintain its humus content by practicing the Law of Return. Other parts of the book are concerned with Equipment Management, Labor Management, Farm Organization, and a brief treatment of accounts for city farmers. The book includes 244 pages and is illustrated with line drawings and halftones.

PORTULACA SEED

Q. When I see those tiny portulaca seeds and find them so low to the ground I wonder how the seed people manage to collect enough of them to sell them in quantities. Can you reveal that secret?

Miss L. O. N., Lorida, Fla.

A. Prior to the last war, portulaca seed was hand-harvested, especially in countries of low labor costs. Much of the seed came from Hungary. When we had to depend on our own seed, other methods had to be designed. One of the greatest wholesale growers of flower seeds, the firm Bodger Seeds Ltd., designed an ingenious method by planting portulacas through slits in a canvas, spread on the ground. When the seeds dropped out, they could be easily collected from the tarpaulin. This method made good use of the growing habit of the portulaca plant; this plant grows very rapidly once it comes up, under the proper heat stimulus, but can be most easily trans-

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planted. If you want to experiment, take a few mature leaves from the lower part of a plant and raise them into full-fledged plants.

—o—

ANTIBIOTICS

Q. There were several references to antibiotics in your magazine. What is the precise meaning of this word?

G. F., Norman, Okla.

A. Professor Waksman, the leader in antibiotic research, makes the following definition: "Inhibiting the growth or the metabolic activities of bacteria and other microorganisms by a chemical substance of microbial origin." If, for example, penicillin is made from the fungus *penicillium* and applied in certain cases of infection by disease organisms, the penicillin acts on these disease organisms and their products and terminates their growth, as a result of which the body recovers. *Antibiotic* means literally *counter to living* or deadly.

—o—

LIST OF SCIENTIFIC MAGAZINES

Q. Could you give me the names of two or three scientific magazines and their address so that I can check up on research in agriculture?

R. P., Boulder, Colo.

A. Soil Science, The Williams and Wilkins Co., Baltimore 2, Md.—*Journal of the American Society of Agronomy,* to be ordered from Dr. G. G.

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—o—

FEATHERS AND SHUCKS

Q. Please give the value of corn shucks and chicken feathers as compost material. The chicken feathers I have in mind have been out in the weather for several months.

The shucks are baled and are offered for sale by a milling company. How much could one pay per ton for them for compost making? I can get the feathers without buying them—just collecting.

C. B., Kentucky.

A. Chicken feathers are valuable for nitrogen; corn shucks valuable for potash. It is impossible to say how much you should pay for the potash value, but the feathers I would definitely get. The corn shucks material makes also an excellent mulch substance for berries, etc., especially if you cover it lightly with earth so that it does not blow. The fact that the feathers are weathered will make things easy; they will decay more rapidly and release the nitrogen, especially if you keep the heap moist.

—o—

FISH OFFAL

Q. I can get a great deal of fish cuttings. How shall I use them?

Miss Ruth S., Sandusky, Ohio.

A. Unless you have plenty of green matter and cover the material well with earth, you are apt to get a highly malodorous heap that furthermore will

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attract flies. Thus it might be wisest to let the amount of available plant matter determine the amount of fish cuttings you should get. If you want to dig fish offal into the ground, you cannot very well plant and cultivate there; but otherwise it is possible and will enrich your soil for later. Provisions must be taken to deter ants. If you do not do this, the ants will not only carry away a great part of the fish matter, but also infest the garden otherwise. This you would presently see from the increase of aphids.

—o—

CORN COBS

Q. Before long we will again have plenty of corn cobs. Do you compost these too?

J. D., Anniston, Ala.

A. There are many ways of using corn cobs. If broken up, they are excellent for a litter in the poultry house; also to keep the hogs clean; thus they become soaked with urine and manure and a valuable addition to the compost. I have used them for mulching grapes and fruit trees and even red raspberries very successfully. I placed them about six to eight inches deep around these plants, and they kept the soil in good moisture and mellow, without interfering otherwise. There are plenty of air spaces left and the young shoots of the berries can easily push through. Such a mulch is also excellent for pest control, because the material is apparently not conducive to insects; besides it keeps the plants healthy and thus also more resistant to attackers. I noticed that such a mulch breaks down easily from the bottom, and I see no reason why it should not afterward be composted.

—o—

MINT

Q. How does one get peppermint tea to keep its full fragrance? I have a large patch of mint, but seem to have no success with the dried product, though many visitors have favorably commented upon the fra-

grance of my mint when they found it freshly plucked in their ice tea.

Mrs. M. O'D., Ohio.

A. The best strains of peppermint available keep a highly satisfactory flavor in the dried stage, in fact, seem even more pungent, so that a tea made from such leaves is as strong as fine flavored peppermint candy. Harvest the twigs, dip in cold water and shake out, let the water dry off for a minute or so in the sun, then place the plants on sheets or paper in a cool room, outside the sun. If you do not want to wash it, you may have particles of earth sticking to the dried product. Harvest fresh growth, for example in July.

—o—

CUCUMBER BEETLE

Q. I find a striped bug on my cucumber leaves. Is there anything I can do against it? We have composted for only a year as yet.

J. H. J., West Va.

A. That is probably the striped cucumber beetle. We have not been bothered with them after using the compost method; but have noticed a successful method recommended:—put a handful of lime and a handful of woodashes in a two gallon sprinkling can, stir well, then apply with the can

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or with a sprayer, taking care that the underside of the leaves is just as much covered as the top. This will not kill the beetles, but seems to drive them away. By next year, when composting has produced a balance in your soil, you will indubitably get along without this.

—o—

PLANT FERTILIZER

Q. I was much interested in the Gardener's Book Club book on the Quick Return Method because it brought home to me quite vigorously a principle that has often been neglected: Grow plants in the refuse of the same plant and give them thereby exactly what they need. After all, the plant refuse contains the minerals which make up the plant and which it therefore must be seeking in the soil. What do you think?

N. P. L., Columbus, Ohio.

A. This is an interesting question, but one which must be answered in two separate parts: (1) Plant refuse from entire plants. (2) Plant refuse from crop plants consisting of only part of the plant. There is little doubt that you can return the same minerals to the soil that were originally sucked up by the plant if and when you return that plant to the same soil. This happens in nature in wild places, espe-

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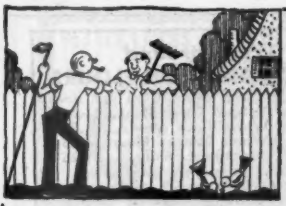
cially in the hedges. But consider a flower garden, from which the cut flowers were taken or a vegetable garden which had to yield to you its best results in roots, leaves, seeds, etc. You have only part of the plants left. The next crop would not receive the same amount of minerals that the earlier crops found. In order to achieve a complete balance, you would have to return the equivalent to what you have eaten or taken into the house or sold.

There is another group of problems involved: In the seed formation, plants store considerable amounts of soil elements. Since seeds, especially grains, are largely sold off the place, the soil becomes depleted in the most essential elements, especially phosphorus and nitrogen, but also in sulphur and potassium, some calcium and magnesium and various traces of other elements. To a lesser extent, but quite noticeably so, the same happens when leaves and roots are sold, though the berries, fruits and seeds are the real storers of soil elements.

A third factor comes in through the adaptability of plants. Grow a vegetable in a soil that is poor in calcium and magnesium, but rich in soda and potash. The plant will pick up the latter elements, though it might need the former and use them if they were abundant enough. A plant manages to grow in an unbalanced soil, but a balanced soil would be preferred. Composting only the wastes from plants may therefore emphasize deficiencies, if the soils are severely lacking in a plant food. It is necessary to supplement the soil with phosphate rock, minerals, nitrogen, etc. that are brought in from the outside by compost methods, fertilizers, legume cropping, etc.

The Quick Return method will, we hope, stimulate observations and investigations in these lines of gardening and soil improvement. But it would be unwise to give up old practices for a method that may be successful only under certain conditions. There is little doubt that by bringing



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in great amounts of plant matter from the outside, for instance, leaves and seaweed, weeds and garbage, a soil could be improved too. But this is another question altogether.

—o—

NATIVE EARTHWORMS WILL TURN COMPOST

Q. Is it necessary to purchase earthworms for your compost heap if you have native worms?
P. G. C., Dallas, Texas.

A. Native worms can be used in the compost heap and in the gardens and fields as compostors and soil conditioners. For turning the compost in the heap, the manure worm is better than the ground worm.

—o—

FEED YOUR WILD ANIMAL FRIENDS

Q. Can you suggest a way to prevent squirrels from eating the entire yield of peaches before they ripen?
G. K., St. Louis, Mo.

A. About the best method to control squirrels as well as Nature's other children is to feed them. There are many foods which squirrels prefer to green peaches. Plant one or more nut-bearing trees in your home grounds. To prevent birds from eating your choice berries, plant a cherry tree especially for them, a variety which ripens somewhat earlier than the cherries you want to protect.

—o—

KINDS OF EARTHWORMS

Q. Will you kindly inform me as to the names of the different species of earthworms and their favorite environments?
J. W. L., Chicago, Ill.

A. There are more than 2,000 species of earthworms ranging in size from almost microscopically small to as much as 11 feet long. They occur everywhere except in the extreme

arctic and antarctic regions. Their favorite habitat is the earth. They sometimes are called the "intestines of the earth."

—o—

EGGSHELLS FOR COMPOSTING

Q. Can egg-shells be used in the compost heap as a source of calcium?
R. L. R., Alton, Ill.

A. Egg-shells are a good source of calcium in a form that is easily available to plants.

—o—

KEEP HEN HOUSE LITTER DRY

Q. How can the litter in the hen house be kept from getting wet?
J. G. K., Edwardsville, Ill.

A. The litter in the hen house can be kept dry by proper ventilation of the house. If necessary, install a revolving ventilator in the roof of the house.

—o—

COMPOST BENEFICIAL IN ALL AMOUNTS

Q. Is there danger of using too much compost in the soil?
A. J. W., Orville, California.

A. Compost is the only fertilizer I know of that can not be used in excess. A little compost added to a plant is highly beneficial, but a plant can grow in pure compost without being injured.

—o—

COMPOST HEAPS WITHOUT FRESH MANURE

Q. How can one build a compost heap if fresh manure is absolutely not available?
D. M. A., Fort Lauderdale, Fla.

A. If fresh manure is not available, substitute such animal residues as bone meal, tankage, dried blood, and dried manures with some old compost added to each layer as an activator.

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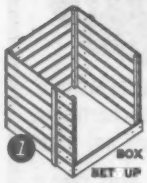

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Orchardist Prefers Organic Fertilizer

NICTAUX West, N. S., May 31—C. C. Ruggles, director of the Middleton Fruit Co. Ltd., stated recently that as a result of observations last year he is using 4-12-6 fertilizer this season. "I had a fairly large crop last year, with a high percentage of large sized apples," Mr. Ruggles said, "However, the colour of the fruit was not as good as it should have been." He blames the use of high nitrogen fertilizer (9-5-7) for this defect and stated that he has decided to use 4-12-6 with a view to reducing the nitrogen content.

Mr. Ruggles, who is a firm believer in organic fertilizers, stated that he has always had remarkable success from heavy applications of barnyard manure. "Using from 10 to 15 tons annually in one orchard, I have invariably been pleased with the returns," he said.

"Too many farmers are going all-

NOTICE TO READERS

The ORGANIC GARDENING Magazine does not accept advertising of chemical fertilizers or other fertilizers which we feel are too strong for the land or poisonous sprays. We do not deny firms access to our advertising columns if they handle chemical fertilizers if they have another acceptable product to sell. The reader should be careful in accepting such advertisements. Our responsibility extends only to the product advertised in our magazine. It does not extend to all of the products handled by a concern.

ORGANIC GARDENING . Emmaus, Penna.

Reprinted from "The Annapolis Post Road"—(Nova Scotia)

out for chemical fertilizers," Mr. Ruggles complained, "and their orchards show it." "Chemicals are only good for one year," he added, "while one good top-dressing of manure will nourish the land for two or even three years."

"Light crops of hay are usually the result of chemical fertilizing in this area, but manure produces a wonderful crop of hay," he said.

Asked for his opinion of *Post Road's* suggestion regarding an experiment with the organic materials, (bone meal, fish and potash, etc.,) Mr. Ruggles said, "It would certainly be worthy of a trial. Years ago when we used only fish meal, manure and other organic substances, our apples kept much longer than they do today. In villages where fish refuse is the only fertilizer used, the gardens produce remarkable crops."

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ORGANIC FARMING LEADS TO PROSPERITY AND HEALTH

October 15, 1947.

I have gardened for the last 50 or 60 years. As a boy I never saw or heard of fertilizers. We hauled in leaves and old hay stacks to bed our stock and cattle; always had tons of good manure. This was spread by hand from wagons with a pitch fork. That was work but it was worth it. Our place was literally alive with worms and it made no difference about seasons. Our crops were so dark green that they appeared to be almost black, and it required weeks to haul in our crops. I have had good gardens all my life and never used a grain of commercial fertilizer.

In 1920 I bought one place that would dry out after a rain and crack. I hauled in sand, refuse such as cotton-seed and hulls from a gin for four or five years, and used lots of lime and good cow and chicken manure. The result was one of the finest garden spots I have ever seen.

I have been a subscriber of garden

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Emmaus, Pa.

magazines and ORGANIC GARDENING for several years. The more I read them the more I am interested and the more I am disgusted with some farm agents and colleges and the bulletins they issue. Why can't men with education and common sense think and see what they are doing to ruin our land and our health by using and recommending commercial fertilizers and sprays?

Here in Spartanburg County we grow more peaches than any other state in the South and fertilizers and sprays are used all the year round. If the farmers had men with brains to lead them they could in four or five years have the finest land, fruit, and vegetables in the world. We have the soil and climate to grow anything we eat. Numerous times I have thought of writing to Clemson College and telling them a few things, but they would laugh at me an old man 70 years of age telling their college professors how to farm and improve crops and land. For less money than it takes to buy fertilizers they could hire men and train them in making compost and in three or four years have the finest soil, fruit, and vegetables capable of being grown. I have thought for years that if they would change to compost from commercial fertilizers we would not have blue mould in tobacco plants or the boll weevil in cotton. If we had stuck to God's plan we would have something now—namely not much cardiac trouble and hypertension. I hate to know as I do that all of us are daily being poisoned.

Mr. A. F. Schell,
R. F. D. 2, Box 221,
Spartanburg, South Carolina.

—o—

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ORGANIC GARDENING

EMMAUS, PENNA.

ravaging my plants. We tried to find earthworms for fishing, but could find only a few sick-looking individuals. The hole we dug in our search for earthworms looked something like the Grand Canyon.

Then one day I received a pamphlet describing the *Organic Gardening Magazine*. I read it and found that all my troubles were described there. We read it over once more with interest and then subscribed to it. I started at once building compost boxes, making compost, and the results are too marvelous to describe. I am sending you pictures so that you may see them for yourself.

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Organic gardening has become my hobby, and I am very proud of the wonderful results. I now regret the sins I have committed against the sacred soil in using commercial fertilizers. I shall never again use them. My father in Switzerland always used compost, but I did not pay enough attention to his practice. *Organic Gardening* has become my garden guide.

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or Permanent Agriculture in China, Korea, and Japan

by F. H. KING, D.Sc.,

formerly Professor of Agricultural Physics, University of Wisconsin; and Chief of Division of Soil Management, U. S. Dept. of Agriculture

COMPOST and compost only is the key to the problem of sustaining the fertility of the East—an East to which Western substitute principles of artificial chemical revivification of effete farm-lands has never penetrated. General and extensive everywhere throughout China and the Far East, compost fertilization is the salvation of a people who must fight for their very livelihood, wrench it from the pitiful pittance of arable land that is theirs.

Scientific husbandry of the type discussed so vividly and cogently by Dr. King must include, of course, not merely constant insemination of the soil, as with us, but, in a land where waste would mean race-suicide, complete use of all by-products as well. From the bounty of his soil the Chinaman returns to it all but the edible part of the crop reaped. His house refuse is destroyed by returning it to clean soil, where natural purification takes place.

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Man's health and happiness depend upon the use he makes of the Earth's Green Carpet. We must understand and adjust ourselves to Nature's processes as regards all forms of life, including soil organisms and those that commonly are regarded as pests. Diseases and pests are Nature's sure signs that not all is well with our culture. The Wheel of Life must be kept turning. Disease is but the beginning of Nature's composting. It is no enemy, but a natural function in Nature.

This is not a book filled with technical terms, it is vividly written. You can almost see the scramble for food and life amidst the myriads of soil bacteria. You see the plants jostling each other for a place in the sun, and above all you see nature trying to anchor and hold in its place the precious top layer of soil without which man would vanish from the surface of the earth.

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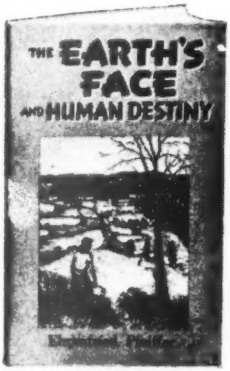

The Earth's Face and Human Destiny

by

EHRENFRIED PFEIFFER
M.D. (Hon.)

with a FOREWORD by

SIR JOHN STAPLEDON

MAN IS THE MEASURE OF ALL THINGS, responsible not only to himself as the measurer—but to that which he measures as well—to the landscape and environment in which he lives, for example.

The interaction of fire, air, water and earth, according to the ancient Greeks, determines the original and native character of a landscape—then man enters! Whether for weal or for woe he does change the face of that landscape. He sins against the biological laws that regulate its health, disturbing its delicate equilibrium and its natural rhythmic cycle of disease and renewal by ignorance of the ways in which to minister to its symptomatic ills. Devastating results accompanied him in his cultural trek through the ages. Leaving a wake of soil exhaustion behind him he has migrated across the globe from East to West. He is now at his Western terminus here in America. That last fertile remnant of the earth *must* be kept healthy if he is to support himself and nature in happiness, to say nothing of his current international duty to save large parts of the rest of the world from starvation and death.

A study of healthy and diseased landscape through all the phases of their improvement or deterioration is a necessary implement in the hands of the crusader for a regenerated natural health. Our age, though progressive in arts, science, industry and business, has been woefully remiss in its attention to the inexorable laws of nature. In wasting the natural resources of our planet it has been as wantonly destructive and prodigal with the precious health of the environment in which it must live as the Vandals scorching the earth with brutal stupidity as their only motive.

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